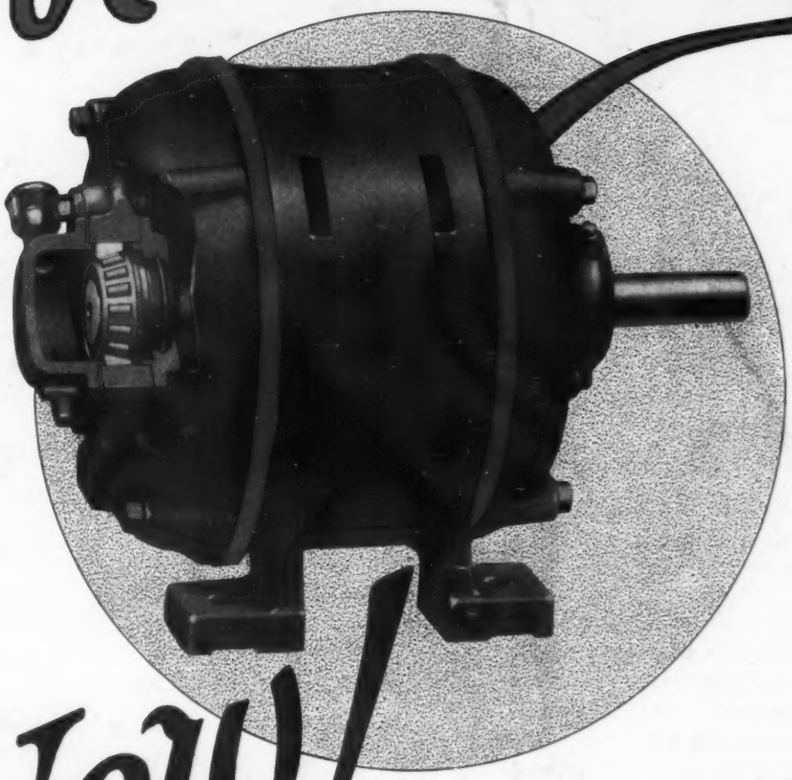
DEC 8 1924

Founded March 1, 1874—Fifty Years of Service

Electrical World

McGraw-Hill Company, Inc. *December 6, 1924* Twenty-five Cents Per Copy

Give **Red Bands** *your hard jobs*



New!

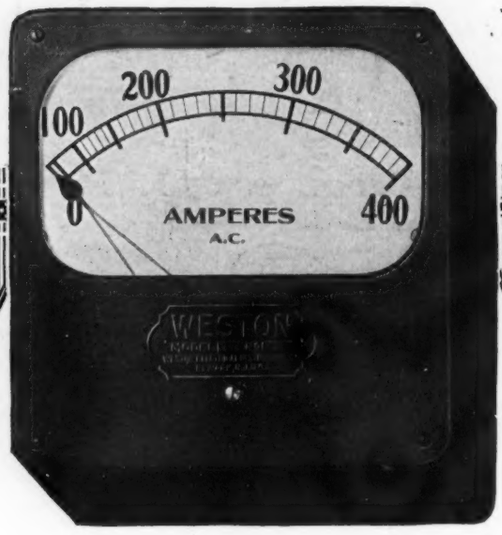
Howell Red Band Motors in all sizes are now available equipped with Tapered Roller Bearings as well as with Howell Patented Re-centering Bearings, optional with the buyer.

Howell Electric Motors Company
Howell, Michigan

(55)

Howell RED BAND ELECTRIC **Motors**

Make Good On The Hard Jobs



"And then they changed their mind"

Recently a well-known Rocky Mountain Utility wrote us to the effect that they had used a certain number of Weston Instruments for twenty-five years. That they were redesigning and changing a part of their plant so they thought of giving us the old instruments for historical purposes.

Later it developed that other work on the same property required a number of similar instruments.

So then they changed their mind and are now putting these instruments back into service although they have been in constant use for a quarter of a century—and were still in excellent condition. Hence the trip to our historical museum will probably be delayed indefinitely.

The new Weston Rectangular A.C. Switchboard Instruments possess the same quality of long life and dependability.

Only the case and the case size is new. This new size, 5¾ in. wide, 6 in. high and 4¼ in. deep, is one that has received commendation everywhere. The changes have been external only. No improvement was necessary in the design of the internal mechanism, which has proven its ability to render a lifetime of accurate and reliable service. Mounting is standardized.

Instant readings are assured by wide scale openings. Scales have great visibility. Instruments are accessible if in need of repairs. They permit of a great saving in space. And the new group is complete.

Thousands of engineers know by long years of experience that Weston Instruments are good instruments. Now with the added space economy feature, Engineers naturally favor the Weston Rectangular Instrument. Perhaps you will also. Let us tell you about them. Write for Bulletin 1504.

Weston Electrical Instrument Co.
13 Weston Avenue, Newark, N. J.
Branch Offices in All Principal Cities

Electrical Indicating Instrument Authorities Since 1888

WESTON

STANDARD - The World Over

Electrical World

The consolidation of Electrical World, Electrical Engineer and American Electrician

Published by McGraw-Hill Company, Inc.

W. H. ONKEN, JR. Editor — HAROLD V. BOZELL Editor

Volume 84 — New York, Saturday, December 6, 1924 — *Number* 23

Interconnection and State Regulation

THE time is not far distant when by reason of wider and wider interconnection and consolidation of generating stations electric systems now wholly intrastate will become interstate. Indeed, many transmission lines now cross state boundaries; but for reasons, expedient and legal, ownership on the two sides of the boundary is commonly vested in different corporations. Thus state regulatory commissions still have jurisdiction. However, the business of transmitting electricity from one state to another, like the business of transmitting any other commodity, constitutes interstate commerce. In the case of natural gas this principle has been sustained by the Supreme Court. But jurisdiction over gas or electric companies engaged in interstate business has not been given to the Interstate Commerce Commission, and thereon hangs a fine legal point. Can such a public utility worm through this loophole in the law and escape regulation altogether? Possibly; but the Federal Power Commission law suggests what seems to us a better way.

There it is stipulated that the Federal Power Commission has power to regulate utilities coming under the federal water-power act and engaged in interstate or foreign commerce whenever the states concerned either have not the authority to act in the matter or cannot agree. The suggestion of co-operation or agreement between several state commissions is an excellent one and should be promptly acted on so that if it involve federal legislation, a suitable measure can be introduced in Congress without much delay. Electric public utilities are content to remain under state regulation, preferring rather to bear those ills they have than fly to others that they know not of; and with a Congress itching to legislate, the states must act quickly to safeguard their rights.

Water-Power Lesson for Public Dissemination

THE Pacific Coast—particularly California—has gone through an unprecedented drought. In place of the usual growth in the use of electrical energy it was necessary to cut down its employment in many sections to the lowest possible figure and then resort to very expensive "rush" measures to supply steam equipment. Every possible unit, large or small, regardless of location or expense of operation, was required to carry the load which the water-power available could not serve.

With all its wonderful water-power resources the Pacific Coast must face the continued need of a certain percentage of steam-generated energy to supplement its hydro-electric plants. In this particular the situation is not different from that in most parts of the United States, except that the Pacific Coast has a greater proportion of water power than most of the other sections and the percentage of steam capacity needed is consequently less than that required elsewhere, except in a few fortunate localities, of which Niagara Falls is the most striking example.

The lesson to be learned—one often pointed out before—is that water power is only a part of the power resources of the country. The difficulty in the past has been the tendency to treat water power as something apart and a cure for every shortage in energy supply. A tremendous amount of publicity within and without the industry has created this impression in the public mind. It is time that the lessons of the water shortage in the West be extensively disseminated in plain language to offset the false publicity that sounds so attractive in newspapers or orators' mouths. Too much latitude has already been allowed the propagators of false theories. The plain, unromantic fact is, as said before, that water power constitutes only one part of the power resources of the country and must be developed along with all the other resources in such fashion that each will supplement the others. Romance must not be allowed further to obscure the facts.

A Use for the Lighting Primers to Follow Up the Essay Contest

SO FAR no plan has been made for the disposition of the primers used in the home-lighting contest after they have been turned in by the school children. Hundreds of thousands of these books will be returned, and they offer a potential educational influence almost as great in possibilities as the essay contest itself.

Why not turn over to every central-station employee a certain number of these primers returned by non-prize-winning students in each community with instructions to study each carefully? At the same time, of course, a personal letter should be written to each boy or girl expressing regret that he or she was not one of the prize winners, complimenting them all upon the excellent work done and expressing the hope that they will continue to take interest in the lighting of their homes.

Such a plan would accomplish two definite things: First, the boys and girls would be made to feel that their efforts had been appreciated and would be encouraged to take an even greater interest in the improvement of the lighting of their homes. Second, every central-station employee would inevitably learn something about lighting. Unfortunately, at the present time knowledge of lighting and proper lighting methods is confined too largely to illuminating engineers, whereas everybody in the electrical industry should be constantly talking better lighting. Especially is this true in the case of central-station employees, since the utilities are most directly concerned.

Right now, following the close of the lighting contest, is naturally the psychological time to get such a movement under way. The Lighting Educational Committee has done an excellent job. Its work, however, ends

with the close of the contest. The lighting committee of the N. E. L. A. would do well to give immediate consideration to some such further use of these primers which central-station companies have purchased and are now holding awaiting instructions as to their disposition.

Wide Use of Electric Pyrometers

A RECENT survey indicates an extremely wide use of thermocouple and resistance-type pyrometers in various industries to indicate temperatures, to control them, to record them and to warn of undesirable or dangerous conditions. The effect in increasing production, in uniformity of the product, in its strictly controllable properties, in elimination of waste and in substituting less skilled labor must be enormous, although no one probably has ever calculated it in dollars. This is another of those cases in which the service of electricity can be measured only in millions of dollars saved indirectly, and not in thousands of kilowatts or millions of kilowatt-hours delivered.

A partial list of industries using pyrometers, not counting the electric and steam industry itself, includes those dealing with oil production, steel manufacture, automobiles, non-ferrous metals, clay and porcelain products, glass, gas manufacture, cement, chemical processes, enameling, laboratory studies of all kinds, and so on. An interesting feature in the introduction of the electric pyrometer has been the dignified quietness with which it took its important place in the industries. There were no grossly exagerated claims, no fights between the systems, but simply a steady, practical improvement in the use of two of the oldest known electrical phenomena, viz., the increase in the resistance of a metal with temperature and the generation of an emf. at a thermo-junction.

Better Liaison Needed Between Industry Groups

THERE is encouraging evidence that the electrical industry is beginning to recognize more seriously the interdependence of its four groups—manufacturers, jobbers, central-station men and contractor-dealers—and that the problems of every branch of the industry also seriously concern the others. In the past many important decisions have been taken that were entirely right from the single point of view, but later proved to be hurtful to one of the other branches of the industry, and it was to provide against such misunderstandings and to help the cause of harmony that prominent representatives of the manufacturers, jobbers and contractor-dealers were appointed to membership on the executive committee of the National Electric Light Association and that addresses by members of any group have become features at the conventions of the others.

All this is in the right direction, but even so there would appear to be good opportunity for a still closer liaison between these groups. The time above all when the outside opinion is most needed is in the meetings when the discussion starts to go adrift on some point of interdependent interest. It would be a very excellent thing if friendly-contact committees of jobbers, central-station men and "electragists" were delegated by their associations to attend the meetings of the electrical manufacturers, not to watch or to "snoop," but to be at hand and of service in interpreting the attitude of the other groups. Similar committees of manufacturers, central-station men and electragists would attend the jobbers' meetings, and at the conventions of the light and power and the contractor-dealer groups there would also be these friendly delegations present ready to promote inter-group unity in the handling of their common problems. It would smooth the course of many worthy movements and insure the avoidance of many unfortunate mistakes.

Are Central-Station Companies "Overlooking a Bet" on Radio?

IN OPENING a radio shop in conjunction with its appliance store, as described on page 1164 of the ELECTRICAL WORLD last week, the Edison Electric Illuminating Company of Boston has taken a step which should return it handsome profits both in money and good will. It seems lamentable that central-station companies have not more generally seen fit to "cash in" on the great popular interest in radio. That they have been slow to venture into the sale of receiving sets speaks well for their conservative policy of "letting well enough alone," but their failure very definitely to tie in radio as a part of their service does not speak very flatteringly of keen business enterprise.

There are upward of three million radio receiving sets operating in homes throughout the country, and, as David Sarnoff has pointed out in the ELECTRICAL WORLD, they are bringing an additional income of $10,000,000 annually to the central-station companies through the greater use of electric light by people who stay at home to listen to the radio programs. Furthermore, Mr. Sarnoff estimates that revenue from battery charging for the operation of vacuum tubes means another $20,000,000, and he foresees a total revenue for the central-station companies from the operation of radio sets by residential customers of $75,000,000 annually within the next five years. Large as these figures appear and desirable as is the money value of this load, of even greater potential value is the popular interest in radio.

Just as fifteen or twenty years ago almost every "honest-to-goodness" boy and youth yearned to be a locomotive engineer, now they want to dabble with radio. The important difference is that while every boy could not realize his ambition to "sit on the right side of the cab," every boy can gratify his craving for mechanical and scientific diversion with a radio set. Nor, with radio, is this inherent mechanical bent outgrown with age, for the father is often just as keen a "fan" as his son.

So why shouldn't the central-station company sell radio equipment? The electric light and power company is, or should be, the acknowledged authority on things electrical in its community. It would be but natural for its customers to look to it for advice and guidance in the selection of radio receiving sets and for a fair amount of service afterward. The good-will value to a company of being the leading authority on radio is enormous; it provides an intimate point of contact with every one of its customers that operates a set. The Boston Edison company and some other forward-looking companies have recognized this opportunity and have taken steps to include the sale of radio equipment as part of their service to customers. That it will be profitable appears almost certain, and central-station companies which hold aloof from this branch of the electrical business are surely "overlooking a bet."

Well-Lighted Public Buildings Are an Asset to the Electrical Industry

RELATIVELY few public buildings are well lighted. This is particularly true of those which have not been constructed recently. Although it may be a thankless task to convert their owners—and also unprofitable from the narrow viewpoint of the income from the particular building—a well-lighted public building is a good advertisement for adequate lighting. No printed or oral discussion of the desirability of adequate and proper illumination can be so impressive as an actual installation, and many opportunities for installing good lighting are to be found in every city.

In museums, libraries and other buildings poor lighting is the general rule. The museum of natural history contains collections which could be reproduced only at enormous expense, but it is likely to be very badly lighted. The same is true of most art museums. A survey of the lighting of libraries reveals in most cases very inadequate and often improper lighting. A real public service would be rendered by those who can and will convince the authorities that the illumination should be improved and show them how to do it, and the millions of persons who annually visit such institutions would reap a great benefit.

Demonstrations are just as effective in selling lighting as in selling automobiles. If the electrical industry does not interest itself in the lighting of public buildings, whom does it expect to do so? This should be a worthy civic duty for an electrical league or engineering society. In the absence of such a body the central-station company can take up the matter just as it does street lighting or any other phase of its service to its home city.

Engineering Educational Investigation Reports Progress

THE endowed investigation of education in engineering of which W. E. Wickenden was made director is well under way, and a recent report of progress shows prospects of very valuable results. Data are being assembled on requirements for admission to and graduation from technical schools, and through co-operative work information as to the number of graduates over a series of years, the evolution of curricula and the present and future occupational demands for engineers is being collected. In a very definite way experimental studies are being made in the theory and technique of teaching, and methods are being devised to weld closer the bonds between the colleges and the organized engineering professions.

The differences between engineering education in this country and in Europe are being studied from the standpoint of all conditions, but probably the most interesting feature of the work has resulted from a study of engineering education in comparison with the education of lawyers and doctors. These professions dictate admissions, curricula and standards, their conditions being met through a careful supervising and grading system enforced by the professions.

These studies show that engineering students in representative schools receive very little less than two years of work which would be entirely acceptable toward a degree in practically any college of arts and sciences. In other words, engineering students receive the equivalent of the two years' collegiate training required for admission to Class A medical and law schools and there is little to support the criticism that engineering courses are too technical. Far otherwise; they are not sufficiently specialized and technical in comparison with the courses prescribed for lawyers and doctors, who receive three or four years of technical training in addition to the two years of collegiate training. Thus it is already shown that engineering curricula are broad and non-technical, and the question arises whether it is advisable to extend the usual engineering course to five or six years in order to measure up to the technical educational standards fixed by other professions.

The constructive work that is being done deserves the hearty support of all interested in engineering education. The teachers, the students and the professional engineers are all vitally concerned in fundamental work of this character, which means so much to the future wellbeing of the country. It is as much their job as it is Director Wickenden's.

Joint Poles in Use

A JOINT committee of the National Electric Light Association and of representatives of the Bell Telephone System has for some years been making a study of the physical relations between electric service systems and telephone systems. This committee has already promulgated a set of well-considered general principles governing the specific case of physical contact usually called "joint use," and these have deservedly met general acceptance. But progress toward developing detailed construction specifications and any general contractual agreement has been somewhat retarded by hesitancy in some quarters to admit that the problem is not insuperable, but that, on the other hand, a co-operative and mutual sympathetic attack will accomplish an equitable solution.

Some obstacles often cited are complications in bookkeeping, plant accounts and valuations, and also division or allocation of liability for accidents. But that these are susceptible of reduction to simple terms providing equitable treatment is evidenced by the report in this issue of the joint-line procedure and practice in Connecticut.

There is also the question of a "dead-line" voltage; but that local conditions, quality of materials and design, protection, etc., are variable factors which permit variation in the acceptable voltage limit is recognized by the Connecticut agreement. Legal responsibility is dealt with in Connecticut in a fairly complete way. It may not be the acme of perfection, but the fact that an agreement was reached and a method adopted—and found workable—is sufficiently conclusive evidence that it is not grossly inequitable to either party.

Joint use of poles is, by its very nature, a matter for joint agreement. A recognition on the part of both major interests (1) that the difficulties are not insuperable, (2) that it was not preordained that electric service lines and communication lines should clash rather than exist together harmoniously, and (3) that even the predominance of prior occupancy by telephone lines was more a matter of the inherently universal character of telephone service—or at least of a natural earlier development of universal service—than of a determination to pre-empt the desirable routes, will aid materially in permitting progress toward general participation in the benefits of joint use of poles whenever desirable or necessary.

Attractive, Well-Designed Los Angeles Municipal Substations

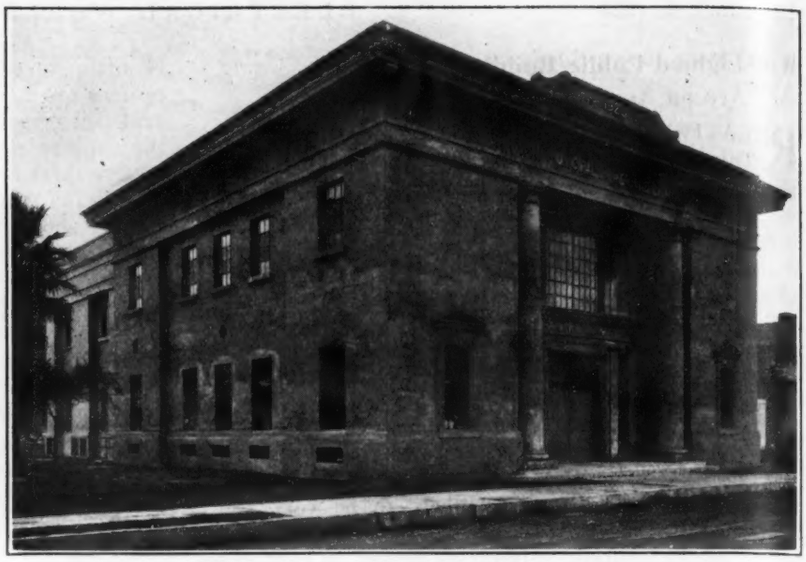
NEW substations for residential and industrial districts are designed to meet present-day service requirements and to add to the attractiveness of the architectural features of Los Angeles.

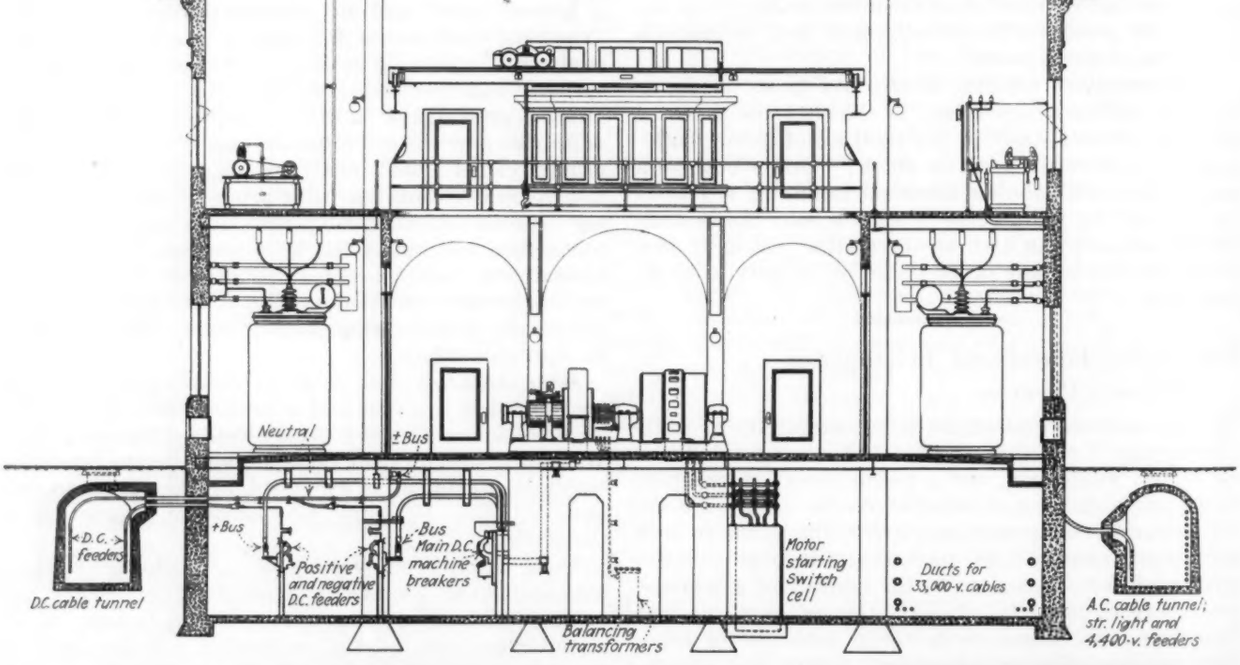
Fig. 1 (upper right)—A substation designed for residential districts.

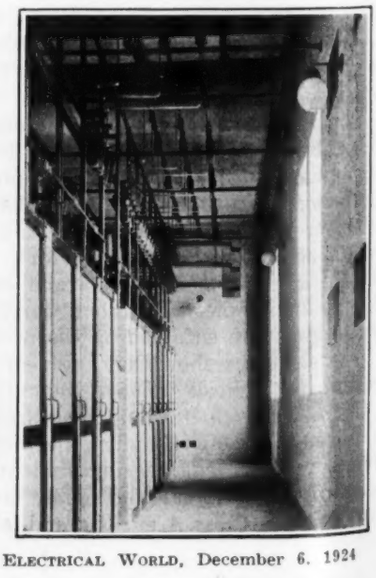
Fig. 2 (center) — Cross-section showing interior arrangement of a typical substation.

Fig. 3 (lower left)—The San Pedro substation is in an industrial district.

Fig. 4 (lower right) — Switch cell arrangement in Francisco Street substation.







Substations for Present-Day Requirements

Unit System Employed in Large-Capacity Substations for City Distribution — Latest Practice as Embodied by City of Los Angeles—Complete Description of a Typical Substation

By LEROY C. WILLIAMS
Distribution Division, Bureau of Power and Light, Los Angeles, Cal.

UNHAMPERED by any obsolete stations to be worked into the design, the problems of constructing substations for the city distribution system of the Bureau of Power and Light of the city of Los Angeles have been greatly simplified. A clear field has been allowed for the best that latest practice and experience could suggest in improved design, equipment, convenience and safety. The ideal sought by the engineers from the inception to the completion of the stations has been maximum efficiency, simplicity of operation, ease of expansion to care for natural growth and foolproofness in their operation—all combined with the highest standard of safety.

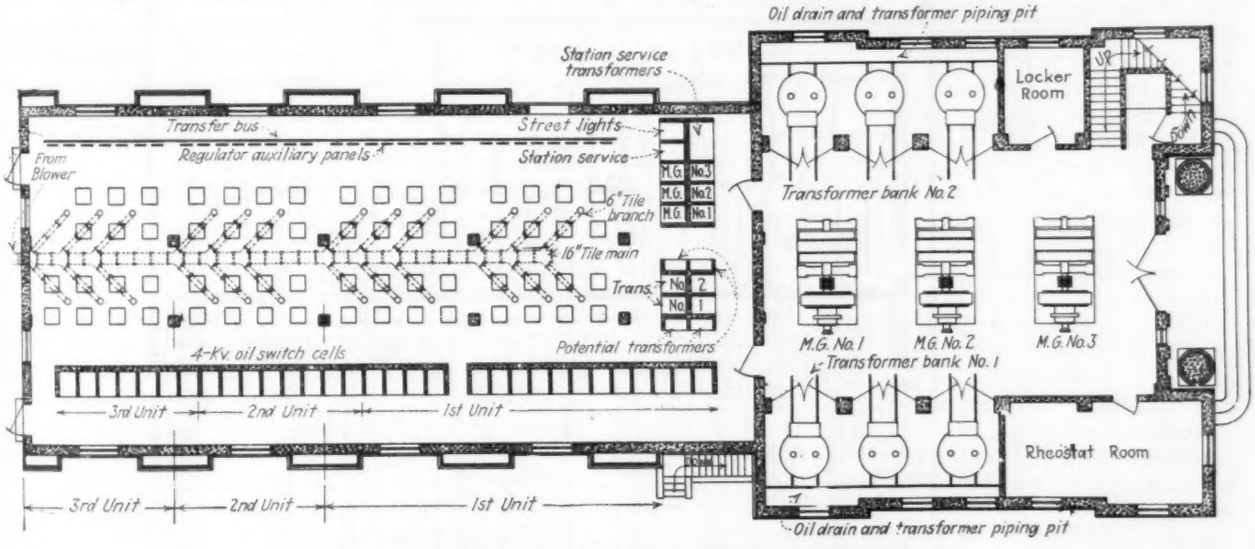


FIG. 5—FIRST-FLOOR PLAN, SHOWING ARRANGEMENT OF EQUIPMENT

The distribution system of the Los Angeles Bureau of Power and Light is composed of the original system of the Power Bureau, to which has been added with more or less complete amalgamation the former Los Angeles city distribution system of the Southern California Edison Company, acquired by purchase in 1922. The present system is now in a stage of transition, and during this period it is being designed and reconstructed for an ultimate transfer from 2,300 volts to 4,600 volts, delta, as the distribution voltage. A considerable portion of the system is already operating at 4,600 volts and the remainder is being cut over at advantageous times. The distribution system has as sources of power the city's own hydro-electric plants in the San Francisquito Canyon, three other smaller plants and power purchased from the Southern California Edison Company. Power from the canyon plants is delivered to the central receiving station at 110,000 volts and thence at 33,000 volts to the general distribution system, composed of a partly interconnected network and designed to deliver power to all distributing substations from at least two lines.

Large and important industrial consumers are fed from 33,000-volt "peddler" circuits originating from the 33,000-volt bus at some nearby substation. This practice is followed in the industrial districts and in the Hollywood motion-picture district, where the studios demand large blocks of power. It is customary to feed these important consumers' substations from two different peddler lines wherever possible. By feeding from the 33,000-volt system the necessity of large-capacity, low-voltage feeders from the general distributing substations is eliminated.

The rapid growth of system loads, the more or less indeterminate location of probable future demands and the difficulty of establishing load centers in certain districts present a difficult problem in system planning. For these reasons the outlying and semi-urban districts will still be served from stations more or less temporary, later to be replaced by permanent stations as the loads imposed necessitate greater capacities.

It is quite fitting that the buildings composing a system made up of a number of plants dependent upon one another for the perfect fulfillment of their mechanical functions should also express this relationship by carrying out a consistent architectural theme. The purpose of the building and the demand for clear surfaces necessitate large, unbroken exterior walls, relieved by the placing of ornamentation at a few points, thus obeying an important canon in art by diverting attention from the general to the particular. The observer at first receives a general impression of character through the effects of mass, form, outline and proportion, later becoming aware of the finer

points. Thus an impression of permanence and beauty is imparted.

Although a uniform plan is consistently followed in developing the exterior treatment of all stations, each individual station is designed so as to be appropriate in the district in which it is to be erected. A plain exterior is commonly used for the stations in the industrial districts, and a more ornamental station is designed for the residence and high-class business districts. The Art Commission of the city of Los Angeles formally approves the exterior design of all stations. The type of building adopted as a standard for the permanent station is a two-story, class "A," reinforced-concrete structure, designed as a combination switching, sectionalizing and load-distributing station.

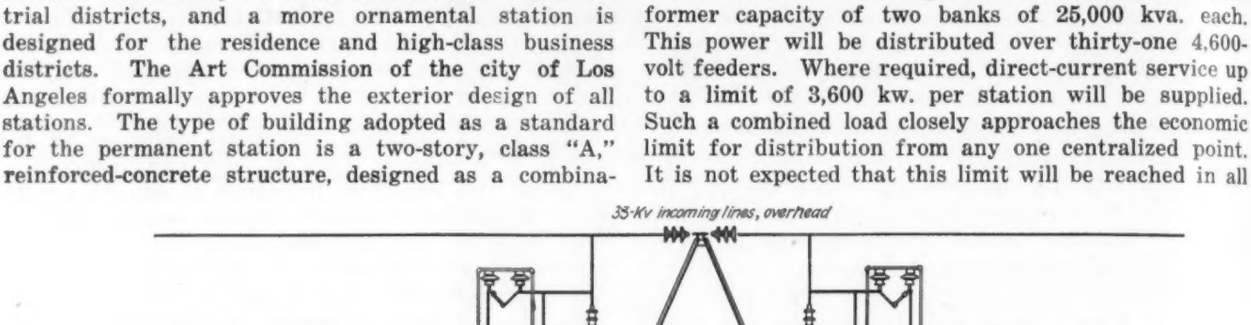


FIG. 6—REAR CROSS-SECTION OF TYPICAL STATION

They are all of the same general type, the high-tension and low-tension switching arrangements being uniform throughout. Stations with rotating machines, either motor-generator sets or synchronous condensers, have the front section modified to accommodate this apparatus. Although the general design of switching equipment is uniform, certain modifications may be made, depending on the requirements for reactors, lightning arresters and protective or current-limiting devices of a similar nature, the demand for which is determined by the location of the station.

Although the stations are at present fed by overhead lines, provision is made to bring the 33,000-volt lines in and out of the stations underground at some future time without disturbing the present station arrangement. The 33,000-volt bus chutes are so arranged as to be incorporated into the exterior design of the station and to prevent unsightly construction.

Studies of system load conditions have quite clearly established maximum station capacities of approximately thirty feeders, each feeder at present being designed for 300 amp., or approximately 2,400 kva. at 4,600 volts. At present most of the feeders are operating at 150 amp., or 1,200 kva.

The stations are designed for an ultimate transformer capacity of two banks of 25,000 kva. each. This power will be distributed over thirty-one 4,600-volt feeders. Where required, direct-current service up to a limit of 3,600 kw. per station will be supplied. Such a combined load closely approaches the economic limit for distribution from any one centralized point. It is not expected that this limit will be reached in all stations, but it certainly will be realized in those feeding industrial sections having large concentrated loads. In such districts short feeders of high capacity prove desirable and increase the economic limit of power distribution.

The substations are designed on the unit principle so that each may be built in multiples of eight feeders. The first unit usually consists of two "bays" or sections and provides for sixteen 4,600-volt feeders and four transmission-line positions. The design permits of the addition at any future time of two bays composing the second and final units respectively. Virtually the only added initial expense is the providing of conduits in the original unit for the future additions. When designed for both direct and alternating-current service, provision is made to install three direct-current units, each consisting of a 1,200-kw. synchronous motor-generator set and twelve direct-current feeders.

Typical plans and cross-sections (Figs. 5, 6 and 10) illustrate the arrangement of apparatus, the general

scheme being to isolate as far as possible apparatus subject to fire hazards and to protect adjacent equipment in case of apparatus failures and at the same time to provide for continuity of service even under extremes of operating misfortunes. To this end the double bus arrangement is used throughout the station on both high-tension and low-tension buses, providing not only insurance of service continuity but switching flexibility of great value in the present period of transition from 2,300 volts to 4,600 volts.

The rear portion of the second floor (see Fig. 10) is occupied by the high-tension switching equipment, each oil switch being installed in a separate cell. The disconnecting switches and operating solenoids are installed in an operating aisle way, obviating the necessity of any one being required to enter a switch cell while the bus or switch is energized. Each cell is provided with oil drainage designed to carry away oil rapidly from damaged switches and to smother the fire in case the oil becomes ignited. The doors are provided with high sills to prevent the flow of oil from cell to cell. Each cell is ventilated either by windows or roof ventilators to prevent the accumulation of gases. The switches themselves are equipped with gas manifolds and vent to the open air. The cell barrier walls are constructed the full height of the room and are completely inclosed, the buses running from cell to cell through bushings. It has been found that damage from smoke resulting from oil fires is as serious in preventing the rapid restoration of service as the fire itself.

The prohibitive weight of concrete cell walls led to the selection of hollow walls constructed of metal lath on each side of a 4-in. channel framework and plastered 1 in. thick with asbestos magnesite plaster, a material of high fire-resisting qualities and mechanically strong, thus making a light-weight wall of great durability. In front of the high-tension cells and otherwise centrally located in the station (Fig. 10) is the switchboard room, from which all switching operations are conducted. All 33,000-volt and 4,600-volt oil switches, 220-volt direct-current circuit breakers and machine auxiliaries are electrically remote-controlled. In the operating room speaking tubes, call bells, telephones and alarm signals are centralized so as to give the chief operator complete control over all parts of the station. In stations having no rotating machinery the switchboard is installed on the lower floor in the front of the building.

The front section of the second floor (Fig. 10) is a gallery, leaving the full height of the building for handling, by means of a crane, all heavy apparatus and the lifting of transformer cores, etc. On this gallery space

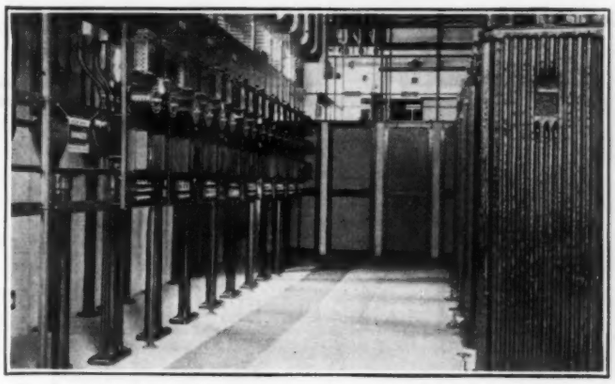


FIG. 7—TRANSFER BUS, REGULATORS AND REGULATOR PANELS, FRANCISCO STREET STATION

is provided for constant-current street-lighting transformers or mercury-arc rectifier sets as required. Storerooms, a battery room and much of the station auxiliary equipment, including the battery-charging motor-generator set, air compressor, etc., take up the remaining space.

On each side of the lower floor (Fig. 5) are the transformer banks, each bank being in a separate vault equipped with fire doors. Ventilation is supplied either by fans or natural draft to provide air volume and ventilation for transformers of 1,667 kva. capacity, the largest self-cooled transformers which may be installed, and ample ventilation for water-cooled transformers of the maximum capacity. Rapid oil drainage is provided in these vaults to carry away oil and smother possible fires and to prevent the spread of oil outside the vaults in case of accident to the transformers.

The rear section of the lower floor (Fig. 5) is entirely given over to 4,600-volt equipment. In this section are the feeder oil switches, regulators and similar feeder equipment. Single-phase regulators are used entirely, the installation being uniform throughout all stations. The scheme as adopted provides ample floor space, room for ventilation and handling of equipment and, of greater importance, absolute safety in all operations. To facilitate the necessary maintenance work an auxiliary or transfer bus (Fig. 11) is installed, and through this medium lightly loaded feeders may be paralleled and transferred, thus allowing all station equipment on any desired feeder to be removed from duty without interruption to regulated service. This transfer bus eliminates the necessity of regulator cut-out switches and also makes possible the use of but one feeder oil switch in place of the two switches customary on a double bus

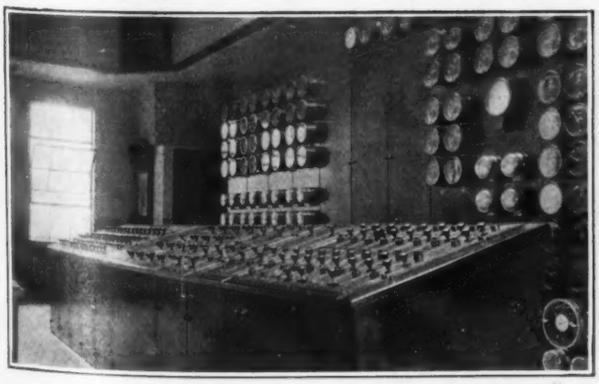


FIG. 8—OPERATING ROOM, FRANCISCO STREET STATION

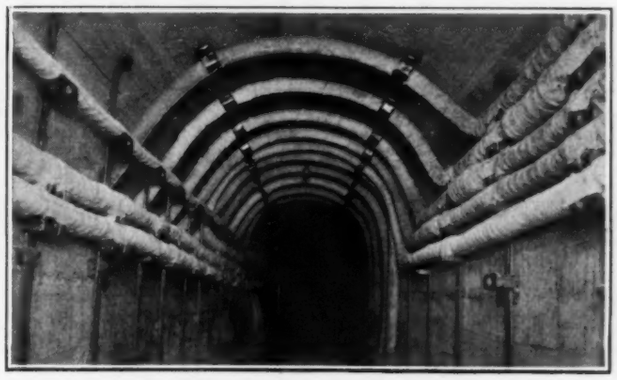
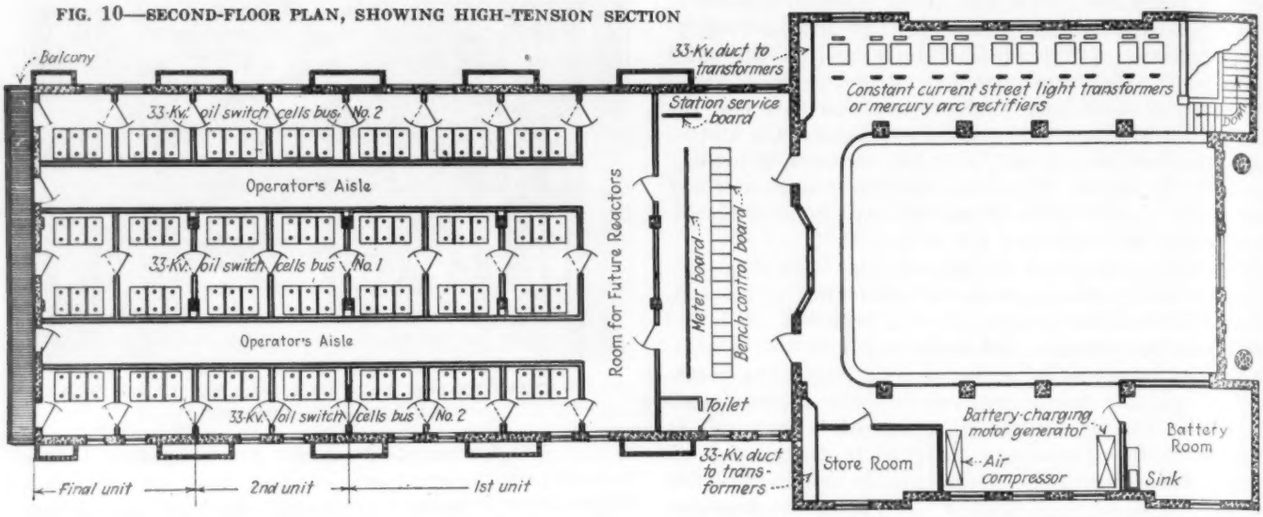


FIG. 9—CABLE TUNNEL, SAN PEDRO STATION

FIG. 10—SECOND-FLOOR PLAN, SHOWING HIGH-TENSION SECTION



arrangement. The comparative cost of the transfer bus with its equipment is about one-half the cost of the extra oil switch with the required disconnecting switches and regulator cut-out switches necessary to allow the usual maintenance of this apparatus without interruption. In addition, this design gives a more flexible switching arrangement than can otherwise be obtained. Modifications may be made in the transfer bus, and it is possible to make it of greater service by the use of bus sectionalizing switches. By installing heavier copper it may also be used as a temporary expedient to furnish unregulated service over all feeders in case both main buses are damaged and out of service. Such a remote possibility does not seem to justify the added expense of copper and the required bus-tie switch, as the same end may be accomplished through the use of temporary leads.

Regulator auxiliaries, requiring frequent attention, are mounted on panels below the transfer bus. These panels also serve to conceal the cables rising from the floor and other apparatus usually difficult to conceal.

Ventilation is provided in the feeder room through natural draft and by fans. In addition, a forced-draft blower system (Fig. 5) is installed below the floor and designed to blow air on the regulators through ejectors similar to a lawn-sprinkler head. Each of these heads directs air on two sides of four regulators. These ejectors are adjustable and are intended to be used to ventilate only those regulators which may be required to carry more than the rated load for sustained periods.

All outgoing feeders leave the building underground through cable tunnels (see Fig. 9). One is provided for the alternating-current feeders, including the street-light circuits, and where required there is one for the direct-current feeders as well. These tunnels eliminate the unsightly appearance and congestion caused by a great number of overhead feeders leaving the same station and provide greater flexibility in handling the cables than can be obtained in combinations of cable vaults and duct lines. From these tunnels the feeders tie into the underground and overhead systems at convenient points.

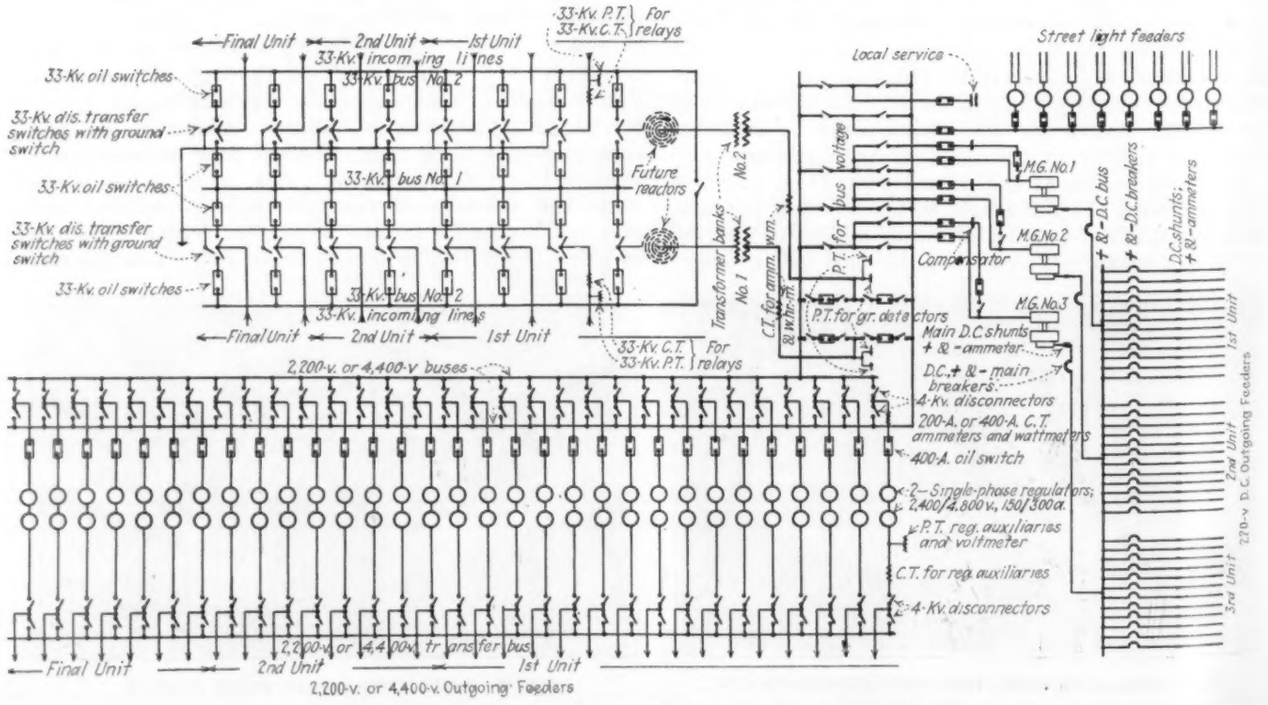


FIG. 11—SINGLE-LINE WIRING DIAGRAM OF TYPICAL STATION

Stations having motor-generator sets and direct-current feeders are built with large and well-ventilated basements in which the direct-current feeder breakers and some of the machine auxiliaries are installed. The direct-current feeder breakers are single-pole circuit-breaker elements, the positive outgoing feeders being grouped in one section and the negative feeders in another, so arranged that equipment of the same polarity may be closely grouped without danger. The breakers are electrically remote-controlled in pairs, one control relay actuating one positive and one negative breaker on each bus. This arrangement promotes safety of operation and helps eliminate the hazards of working on the direct-current buses. From the basement the feeders are distributed through a cable tunnel, similar to those already described, to the general underground system.

Throughout the entire station alarm systems have been installed designed to call attention to switches tripping, overheating of apparatus, stoppage of oil or water flow, overloads on equipment, etc. Pilot lights on the incoming lines indicate sources of energy. All of these arrangements contribute to the convenience and simplicity of operation.

The station lighting circuits, normally fed from an alternating-current source, are augmented by emergency direct-current circuits from the station battery and so arranged as automatically to transfer from alternating current to direct current in case power goes off the station, thus providing the station with light under all emergencies. Switches, apparatus and equipment of all kinds are clearly labeled and, coupled with a logical arrangement of station equipment, contribute to the production of continuous service.

Practical Ways to Correct Power Factor

Use of Synchronous Motors Advocated—Their Neglect by Power Companies—Proposal that a Bonus Be Paid for Each Kva. Installed—Discussion of Other Methods—Illustrative Example

By H. B. DWIGHT
Hamilton, Canada

IN DECIDING questions regarding power-factor correction or questions involving the choice and application of different types of apparatus it is a good method to make use of actual cost estimates of typical cases. A more correct decision can be made with definite figures before one than if trust is reposed merely in general impressions.

Estimated costs are subject to the criticism that they may be too high or too low. Costs of different sizes and types of motors, however, such as are discussed in this article, are much more definite than costs of labor or of outdoor structures. The costs mentioned herein are similar to catalog prices. If they are in error, it is probable that their proportions are fairly correct, and so the general conclusions deduced from them should be reliable.

There are opportunities for power-factor correction to be obtained from synchronous motors which are largely neglected by the power companies, although these companies try, even by drastic penalties, to have every customer maintain a power factor as high as 85 or 90 per cent. A typical case in support of the above statement will be described.

Suppose a new factory is being built and that its average load will consist of:

	Kw.	P. F. (Per Cent)	Reactive Kva.
(a) Lighting	100	100	0
(b) Induction motors	500	75 lagging	440 lagging
(c) Synchronous air-compressor motor	200	80 leading	+150 leading
(d) Induction motor-generator set, to supply direct-current motors	400	85 lagging	250 lagging
Total	1,200	91 lagging	540 lagging

It will be seen that, even with an induction motor on the motor-generator set, the power factor of the average load is 91 per cent. At peak loads the kw. will be greater, the magnetizing current will be practically the same, and so the power factor will be higher than for the average load. There are very few localities where a power-factor penalty would be applied to a load with power factor as good as this.

The power factors given for items (b) and (d) may seem rather low, but they are for average loads, when the motors are not all fully loaded. The comparatively large proportion of direct-current motors indicated by (d) is not unusual, for direct-current motors are applied in many places where the main supply is alternating current, on account of the good control with crane and elevator motors and the flexible speed variation and adjustment with machine tool and other drives.

There is obviously an opportunity to use a synchronous motor in item (d) in place of the induction motor. If this be an 800-hp., 80 per cent leading power factor, 800-kva. motor, its rated leading reactive kva. will be 480 and the item will be:

	Kw.	P. F. (Per Cent)	Reactive Kva.
(d_1) Synchronous motor-generator set to supply direct-current motors	400	64 leading	480 leading

The totals now become:

	Kw.	P. F. (Per Cent)	Reactive Kva.
Total	1,200	99 leading	190 leading

The installation of the synchronous motor has, therefore, provided considerable improvement in power factor. It is a very poor method of expressing the amount of the improvement to say that the customer's power factor has been changed from 91 per cent lagging to 99 per cent leading. This is, nevertheless, a common method of statement and one which forms the basis of many power-factor clauses in contracts. A statement which conveys much better information

regarding the cost to the customer and the benefit to the power company is the simple statement that 730 leading reactive kva., amounting to 61 per cent of the kw. load, has been added by using a synchronous motor instead of an induction motor in item (d'). Power-factor clauses should be written in accordance with this latter statement if they are to secure the greatest benefit to the power companies and the fairest justice to the customers.

Let the motor of (d) or (d_1) be 800 hp. The cost of the induction motor will be approximately $6 per horsepower and the cost of the synchronous motor of (d_1) $9 per horsepower. It will therefore cost the customer an additional investment of $2,400 to provide the 730 leading reactive kva.

If the customer can be assured that his power bills will be reduced each year by an amount equal to about 20 per cent of the additional investment, or $480 per year, then the installation of the 800-hp. synchronous motor should prove attractive to him. This amount, it will be noted, is 60 cents per year per kva. of the synchronous motor.

The price of the energy consumed by the above-described synchronous motor would probably be at least $12,000 per year, though it would vary considerably according to the load factor and the part of the country in which it was installed. The bonus of $480 per year, or 60 cents per year per kva. of the synchronous motor, is seen to be 4 per cent of the power bill for the synchronous-motor load alone, or about 2 per cent of the bill for the entire load. If the cost of power is higher than indicated, these percentages will be even smaller. Now, 730 leading kva. is sufficient to correct the power factor of a 1,200-kw. load from 68 per cent to 90 per cent. The low power factor of 68 per cent would in some contracts involve a penalty of 32 per cent of the entire energy bill, 90 being 32 per cent greater than 68.

The contrast between a 32 per cent penalty, as sometimes imposed, and a 2 per cent penalty or bonus, which has been shown to be sufficient where a medium-sized synchronous motor can be used, shows that power-factor correction by synchronous motors is an extremely economical method.

The above example also shows that where the type of contract is in force which would impose a 32 per cent penalty for a 68 per cent power-factor load, a customer will not install all the synchronous motors which he might easily do. He will merely correct the power factor up to 90 per cent and stop there.

METHOD PROPOSED TO INSURE CORRECTION

The method which the writer would propose for obtaining the desirable results of having as many synchronous motors as possible connected to the lines and of having them all run as strongly leading during working hours as their capacity will permit is quite simple. It was described by him in the ELECTRICAL WORLD of February 9, 1924, and is, briefly, that the power companies should give a rebate based on a certain number of cents per installed kva. of all synchronous motors and other unity-power-factor apparatus, payable as long as the motors are kept running during working hours with the maximum field current which they can safely carry. The rheostats would be set for this value of field current and then left unchanged.

In order to make the proposal definite, a figure of $1 per year per kva. of synchronous motors may be considered. This figure could be adjusted from time to time as the need for more or less leading reactive kva. is shown. This is much smaller than many present power-factor penalties, and yet it is large enough to secure the choice of synchronous motors in a great many cases. While many applications of synchronous motors in cities are smaller than 800 hp., yet low speeds are not uncommon, and the cost of a low-speed synchronous motor is very close to that of an induction motor, even though the cost per horsepower becomes $15 or $20 for 100-hp. sizes. Synchronous motors require virtually no more attendance cost than induction motors, now that they are made self-starting and self-synchronizing.

One of the chief advantages of the above-described method of bonusing synchronous motors is that the exact amount of money to be received from installing the more expensive machines is definitely known in advance for each machine, and so a decision is far more likely to be made in favor of the synchronous type than with the form of contract where the effect of any single motor is very uncertain.

Since the difference in cost of synchronous and induction motors is in many cases only a few dollars per horsepower, it seems uneconomic and even hopeless to try to induce customers to adopt methods of power-factor correction of which the unit costs are perhaps ten times as great. The fact that the price is $35 per horsepower for a 2-hp., three-phase induction motor, $55 for 1 hp., and 50 per cent or more above these figures for single-phase motors indicates the futility of making radical changes in the design and application of small motors. It is better to concentrate attention on the opportunities of obtaining more synchronous motors and of running those already installed with as strong field current as possible. In most cities the synchronous motor would be scattered throughout the network, but this is really not very necessary, for the main disadvantages of low power factor would be overcome if the power factor of the entire system were raised close to unity. This could be done in practically any city if every opportunity for obtaining leading kva. by installing synchronous motors were utilized.

Power companies have been trying for a considerable number of years to improve power-factor conditions by dealing with the customers of lowest power factor, who were small customers or the owners of small induction motors. These efforts have not produced a sufficient total result. If the system power factor is to be brought up to a certain average, some customers must be encouraged to be better than average, for there will always be some that are worse than average. It is therefore now time that the power companies turn in addition to their larger customers for relief, even though the latter have a fairly good power factor.

In conclusion, the present common form of power-factor clause, which makes the charge for energy practically inversely proportional to the power factor of the customer's load, is defective in that, first, it does not show exactly what will be the gain from installing a certain synchronous motor; second, it does not encourage a customer to install a second or a third synchronous motor, or to run such motors at a strongly leading power factor, and, third, it discourages the use of electric power by imposing much larger penalties in many cases than the cost of low power factor would justify. A charge for energy on a kva. rate has the same defects. A comparatively small bonus per year per kva. of all properly adjusted synchronous motors would overcome the above defects.

Hollywood's Street-Lighting Installation

Specially Designed Standards and Lamps Combine Beauty with Effective Illumination —Flexibility of Posts an Important Feature —Costs of Installation and Maintenance

By O. J. HELVEY
Street-Lighting Specialist General Electric Company, Los Angeles, Cal.

THE era when street lighting was confined strictly to utilitarian purposes is past. Our lighting systems now not only illuminate but beautify the streets. This is certainly true of the ornamental street lighting recently put in operation on Hollywood Boulevard in Los Angeles. The new system extends from the intersection of La Brea Avenue and Hollywood Boulevard to Hollywood Junction, a distance of more than 3 miles, and comprises 354 two-lamp standards. In addition, contracts are being executed or will soon be awarded covering five other sections of boulevard, utilizing an additional 823 standards and making a total of 1,177 ornamental posts for Hollywood with several hundred more in contemplation.

When these plans are completed, Hollywood, the motion-picture center of the country, will be one of the best-lighted communities in the world. The beautiful copper-finished two-lamp Union Metal standards which are being used exclusively were especially designed for Hollywood by J. W. Gosling of the illuminating engineering laboratories of the General Electric Company. These standards are 17½ ft. to the light center, and the lighting units are the form 18 eight-paneled lanterns with alabaster rippled glass. Each lantern is equipped with a dome refractor which redirects to the sidewalk and the street the rays of light which would otherwise be lost above the horizontal. An even distribution of light on the street surface with the elimination of undesirable shadow is thereby insured. Just enough light passes through the refractor and the eight glass panels in the top of the lantern to add to the attractiveness of the installation.

ORNAMENTAL STREET-LIGHTING UNIT WHICH WAS DESIGNED ESPECIALLY FOR HOLLYWOOD

The lamp standards are built up of fluted pressed-metal shafts with steel anchors and tie rods and a scientific sectional construction which makes them readily absorb shock and vibration, thus insuring safety and long life to lamps and glassware. The lamp standards are so constructed that if struck by a truck or automobile they will bend over but will not be shattered. This means protection to human life as well as to lamps and glassware. The potheads are so designed that in case the post is knocked completely over the cover of the pothead will be pulled off, thereby disconnecting the wires to the standard. When the cover

NIGHT VIEW OF HOLLYWOOD'S STREET-LIGHTING SYSTEM

DAYLIGHT VIEW OF HOLLYWOOD'S STREET-LIGHTING SYSTEM

is pulled off, the circuit is automatically closed so that there is no interruption in service to that particular series of posts.

The standards are placed 120 ft. apart on opposite sides of the street. Each one of the standards is equipped with two potheads, and the lanterns are provided with auto-transformers with taps which permit the use of 4,000, 6,000 or 10,000-lumen lamps. At present the lanterns are equipped with 4,000-lumen "Mazda" lamps, which may be changed when desired to lamps of higher rating by merely changing the taps on the auto-transformers.

USES TWO CIRCUITS

There are two sets of circuits—midnight circuits and all-night circuits. Both lights on about half of the standards and one light on the other half are turned off at midnight so that after this hour only one-quarter of the lamps are lighted. The capacity of all circuits is 15 kw., and two 15-kw. type RO transformers are mounted on each feed pole, one for a midnight circuit and the other for an all-night circuit.

Anderson primary time switches placed ahead of the transformers on the 2,200-volt circuit control separately the midnight and all-night circuits.

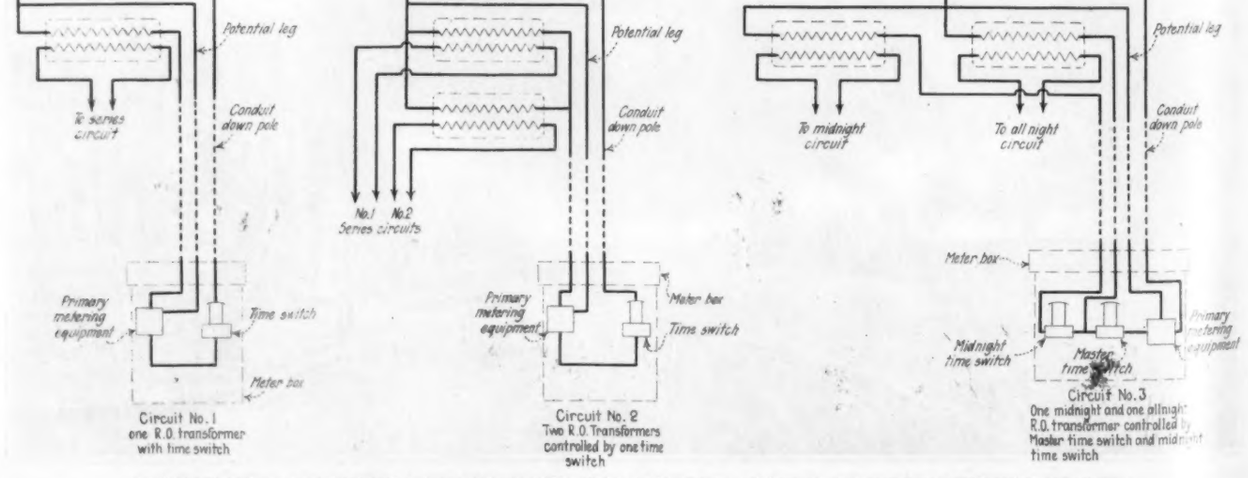
The faces of the bases of the standards are 10 in. from the face of the curb. The conduit is run within 4 ft. or less from the curb and at least 15 in. below the surface of the sidewalk, except across finished streets, where the conduit is kept at least 24 in. below the surface of the street. The No. 8 varnished-cambric, lead-covered cable is carried to the standard in 1½-in. or 1¼-in. galvanized-iron conduit. These circuits were carried by the contractor to metal boxes 7 ft. above the ground on the feed poles and there connected to a type M porcelain disconnecting cut-out. The work above this point was all done by the power company.

The cost of labor and material for this street-lighting system was $4.85 per foot of property. The entire cost was borne by property owners and was assessed against the frontage. The cost of maintenance will average about 59 cents per property front foot per year. This covers the cost of lamp renewals, energy and all estimated repairs to the system.

The plans and specifications were prepared by R. H. Manahan, city electrician of Los Angeles, and the construction work, which was done by the Paulsen Construction Company, was under his direct supervision.

Bricklaying Now Is Done by Electricity

AN ELECTRIC bricklaying machine which it is claimed lays 1,200 bricks an hour is the latest application of electrical energy to industry. Upon rails placed around the outside walls of a building a traveling boom is set, and upon this are the mortar tank and the laying mechanism, driven by a 3-hp. electric motor. The laying wheel rotates, taking two bricks from the carrier, while another wheel spreads mortar as the carrier moves along the boom. At the end of the wall the machine changes direction and proceeds as before until it has laid one row of bricks entirely around the building. The boom is then raised the thickness of one row of mortar and bricks, and another trip begins.



TRANSFORMER AND CIRCUIT ARRANGEMENTS FOR DIFFERENT CLASSES OF STREET-LIGHTING SERVICE

Joint Use of Poles by Utilities

Connecticut Experience Has Proved Advantageous to Both Those Concerned with Power Circuits and Those Concerned with Communication—How Satisfactory Contractual Relations Have Developed in Past Few Years

By A. E. KNOWLTON

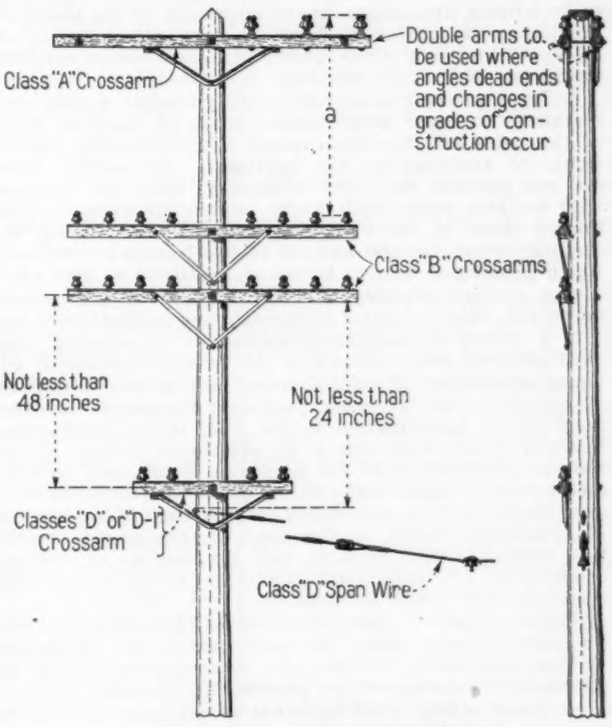
Electrical Engineer Public Utilities Commission of Connecticut and Assistant Professor of Electrical Engineering, Yale University

IN THE early days of the pole-using utilities there was little occasion for two or more companies to use the same pole in common. The number of structures in close proximity was then few; but as the number of utilities and the extent of their facilities increased in response to increased demand for power, communication and transportation services it became more and more necessary to consider such factors as economy, safety, convenience, public sentiment and a changing view as to the scope of our highways. The highways were beginning to be viewed as the natural channels for the distribution of such services as well as for public travel. The public was also becoming less inclined to accept as inevitable the installation of separate pole lines for each utility. Utilities thus began to negotiate for the right to use the poles of others for their circuits. In some instances this was carried out in a spirit of reciprocity, no cross-charges being indulged in; in others a rental basis was adopted. The time soon arrived, however, when the feeless permit basis was no longer feasible or in all cases fair and when the rental basis either involved too much bookkeeping and became otherwise burdensome, or could only be kept equitable by resort to detail.

This development was true alike of urban, suburban and rural facilities—in the cities because of the congestion, pole conflicts and service conflicts; in outlying districts because of probable reduction of investment in distribution facilities without incurring undue increases in operating costs. The logical outgrowth of this situation in Connecticut was joint ownership of poles, or at least joint use in one of its several forms. This article is devoted to a discussion of joint-use practice as evolved in that state, not because it originated there, nor because perfection in procedure has been attained, but with the thought that its administration as this has developed may be sufficiently complete to interest other localities.

PRACTICE OF SIX YEARS AGO

In 1918 T. N. Bradshaw, who had been chairman of a utility committee which was asked by the Public Utilities Commission of Connecticut to co-operate with the commission's engineers in drafting specifications for joint pole-line construction, wrote for the ELECTRICAL WORLD (Vol. 72, No. 18) an article describing the practice based on the specifications recommended by the committee and promulgated by the commission (Docket 1447, Order D). Six years' experience under this set of construction specifications and its attendant administrative procedure have resulted in marked changes in both phases. Very little modification in the values of clearances between circuits of different character has been found necessary, but the drift of communication companies toward cabled circuits and of the power companies toward higher voltages for distribution purposes, and in general toward standardization of construction materials and methods, has permitted broadening the field of joint use. The development of telephone-line protection toward effective functioning at higher voltages has not been accomplished. The principal factor in promoting this expansion has been ability on the part of the power companies so to construct and maintain their higher-voltage circuits to high standards as to reduce to a permissible degree the hazards created by their close proximity to communication lines.


Double arms to be used where angles dead ends and changes in grades of construction occur
Class "A" Crossarm
a
Class "B" Crossarms
Not less than 48 inches
Not less than 24 inches
Classes "D" or "D-1" Crossarm
Class "D" Span Wire

Minimum Separations (inches)			
Dimensions	Class "A" Voltages		
	5000-7500	7500-15000	15000-50000
a	48*	48	72*

* See Part II Section 3

VERTICAL SEPARATION OF LINES REQUIRED IN CONNECTICUT FOR JOINT POLE USE IN CLASSES A, B AND D OR D-1

Underlying, however, the mutually acceptable details of joint pole-line construction is the contractual character of the whole enterprise. The communication utilities originated and advanced a "general agreement"

which has been accepted by many of the power and railway utilities. Much the same form of agreement exists between these larger utilities and their smaller neighbors. Some of the outstanding clauses of this "general agreement," which varies only in minor details as drawn up by different pairs or groups of utilities and is in effect over most of the area of the state, are as follows:

1. It is often desirable and sometimes imperative that certain poles be jointly used.

2. The territorial limits covered by each general agreement are defined.

3. Voltage and other limiting characteristics below which joint use shall be general and above which it will be entered into if preferable to separate lines are either stipulated in the agreements or implied by the revised joint use Docket 1447, Order BA, of the Public Utilities Commission. The docket places no absolute upper limit of voltage for power circuits nor corresponding sensitivity limits for communication circuits.

4. A custodian is designated by agreement in each instance of application of the general agreement. The custodian may or may not be the original owner, but is usually the party most interested in the poles and is made responsible for their maintenance at all times. There is to be written application to the custodian of the poles for acquisition of permanent rights on each pole or group of poles. Permission shall previously have been obtained from each other joint occupant.

5. The newcomer is to pay to the custodian a sum representing an equal proportionate share of the then value of the poles and for the expense of rearranging attachments to accommodate the applicant. If existing poles are not suitable for joint occupancy, they are replaced with suitable poles, each party paying an equal proportionate share of the cost, the applicant reimbursing the original owner for the amount of life left in the old pole which is being discarded before it has lived its full life.*

6. A similar procedure is outlined to cover cases where municipal, state or federal requirements necessitate joint use.

7. A utility contemplating extensions of existing lines shall give the other parties to the general agreement advance notification of its intention, that proper advantage may be taken by the other parties of the opportunity for their future participation in the joint use of such poles. Space reserved in advance is in some cases paid for at the time of construction of the line even if not used immediately; in other cases payment is made at time of occupancy.

8. There shall be exchanged, at the time of acquisition of permanent rights, a statement containing the specific pole numbers, their location and the amount of vertical space allotted to each party for its use.† [A sample pole record card is shown herewith.]

9. The height of each pole shall be such as to provide the allotted gain space for each utility, the prescribed vertical separation between the various circuits and an appropriate clearance of all attachments from ground.

10. Each utility shall maintain at its own expense its own attachments on the joint poles. If the placing of subsequent attachments tends to pull the pole out of line, the utility shall guy or brace the pole, such guy or brace thereafter to be considered a part of the pole.

11. Any expense of replacement or relocation of the pole, necessitated, for example, by highway alterations, shall be borne equally by each party; the pole work shall be done by the custodian, unless otherwise specifically agreed upon, and the attachment work by the individual utilities at their own expense.

12. If such replacement or relocation is necessitated by the purpose of only one utility, that utility shall stand the expense not only of changing the pole but also of the reconstruction and transfer of attachments of all occupants.

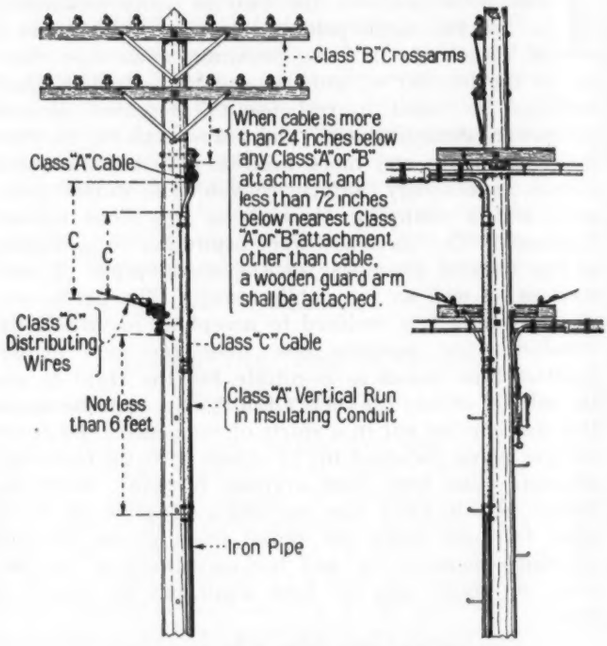
13. If a pole not expressly erected for joint use shall become inadequate for the facilities of the original owner, the cost of the pole replacement shall be borne equally by all occupants.

14. Provision is made for the abandonment of occupancy by any one of the utilities using the pole, with reimbursement, under certain limitations, for its share in the then value of the pole. Certain alternatives are also provided.

15. Each party shall be liable for all damages for such injuries to persons or property caused by its sole negligence or by its failure to comply at any time with the specifications herein provided for.

16. In case of concurrent negligence or of accident not attributable to negligence of a particular party, (a) each party shall be liable for all damages for injuries to its own employees or property; (b) each party shall be liable for its proportionate share of all damages to persons or property not associated with any of the parties.

17. Payments under workmen's compensation acts or to any employees' disability or death benefit fund shall be construed as damages referred to in paragraph 16.


Class "B" Crossarms
When cable is more than 24 inches below any Class "A" or "B" attachment and less than 72 inches below nearest Class "A" or "B" attachment other than cable, a wooden guard arm shall be attached.
Class "A" Cable
C
C
Class "C" Distributing Wires
Class "C" Cable
Not less than 6 feet
Class "A" Vertical Run in Insulating Conduit
Iron Pipe

Minimum Separations (inches)			
Dimensions	Class "A" Voltages		
	5000–7500	7500–15000	15000–50000
C	40	60	60

RELATIVE POSITION AND SEPARATIONS OF CLASS B CROSSARMS, CLASS C CABLE AND GUARDARM, CLASS A CABLE AND GUARDARM AND CLASS A VERTICAL RUN AS SPECIFIED IN JOINT POLE RULES IN CONNECTICUT

18. Questions of negligence or concurrent negligence shall be determined by mutual agreement or by arbitration.

19. Provision is made for transfer of shares in joint-pole ownership to a similar utility in cases of purchase, merger, consolidation, etc., and for the general mortgaging of property represented by the shares.

20. Docket 1447, Order B-A, issued by the Public Utilities Commission of Connecticut, December 6, 1922, is prescribed for the method and manner of constructing joint lines.

*It will be noted that no reference is made to the number or character of the proposed attachments; each utility pays its proportionate share of the value of the pole regardless of these. In the early days of joint use the share of ownership in the pole was determined by the number and character of attachments, but the cross-billing and records became prohibitively cumbersome and expensive, and the cost value of the pole was subsequently assumed equally by all occupants.

†These "Acknowledgments of Permanent Rights Upon Specific Poles" constitute the detailed application of the general agreement to each individual case. The vertical space is defined in terms of the number of gains at standard spacing. Different companies have varying ways of keeping records of their rights on and share in the joint poles on which they maintain circuits and attachments. Some keep a card record of poles by streets; others not only keep a record of individual poles cross-indexed by maps, but even indicate on the card more or less detailed information of the location and character of their attachments. One utility which maintains about 362,000 poles, 99,600 of which are jointly occupied by other utilities, has four clerks and two typists engaged in the routine handling of the permits, acknowledgments, maps and individual card records. This will give some indication of the cost of such a system.

Form 248 11-22-1924

JOINT POLE RECORD

Pole No. _____ Owner _____ Town _____

Location _____ Exchange _____

Map _____ P. P. Permit _____ Date Placed _____ Size _____

Estimate No. _____ Cost _____

OCCUPANTS	RIGHTS ASSIGNED	PERMIT	AGREEMENT	DATE	INTEREST IN POLE	PRESENT VALUE

Date Replaced _____ Size _____ By _____ Company

Date Removed _____

Date Transferred _____ To _____ Company

Remarks _____

COMPANY	VOUCHER OR RECOM. FOR BILL PASSED		AMOUNT
	DATE	NUMBER	

RECORD CARD FOR POLES IN JOINT USE, WHICH HAS PROVED SATISFACTORY IN CONNECTICUT PRACTICE

The cost of providing and setting poles in cities and in rural districts differs considerably because of local sources of supply, variations in wages and overhead charges, etc. For this reason one single schedule of pole prices is not possible. The table shown in condensed form herewith is the one now in effect largely for urban installations. The schedule of pole values can, of course, be varied as necessary from time to time during the life of the general agreement.

Provisions of Order B-A

Order D, issued March 26, 1917, provided specifically for joint use involving ungrounded supply circuits of 5,000 volts or less between conductors, grounded supply circuits (including trolley feeders) of 2,500 volts or less to ground, and constant-current series circuits of 7.5 amp. or less, with communication circuits. Circuits of higher rating than these could be carried jointly on poles with supply circuits but not with communication circuits.

Order B-A supplanted Order D in 1922 and, in addition to minor changes at certain points and a rearrangement of the subject matter, provided, with certain limitations, for joint use, involving with communication circuits supply circuits of higher voltage and current ratings than the above. Joint use is not recommended in preference to separate pole lines in all cases. Situations do arise, however, where it is impracticable to separate the lines sufficiently to avoid overbuilding or where service drops from parallel lines would interfere with one another. Part 2 of Order B-A provides construction specifications for joint lines necessitated by such conditions. It prescribes a minimum vertical separation of 72 in. between line conductors of communication circuits and supply circuits of voltage values between 5,000 and 50,000. The requisite strength of construction is based on certain factors of safety, assumed loadings and classified grades of construction not substantially different from those of the National Electrical Safety Code. Certain paragraphs deal with vertical runs, insulators, pin and wire fastenings, cross-arms, poles and pole treatment, guys and guy insulators.

Eighteen plates were published with the order to exhibit typical installations or representative combinations of circuits and attachments. Two of the plates are shown herewith, taken from Part 2, covering higher voltage joint use.

Advantages of Joint Use

Safety.—Circuits carried on closely conflicting lines of poles can only with difficulty be maintained at levels which provide adequate vertical and horizontal clearances between conductors of different voltage classifications. The hazard to persons and property is reduced by carrying the conductors on joint poles, by this means insuring the proper vertical clearances and separations and also eliminating conflicts between conductors of one line and the poles of another. Weaving of service leads from pole lines on opposite sides of a roadway is also avoided. Requisite climbing and working space can be provided with greater certainty of permanance. In fact, there has been a gratifying decrease in the number of accidents to employees engaged on both classes of circuits since the promulgation of the original joint use specifications and the entry into standardized joint use.

Economy.—Two or more lines of poles erected on the same side of a street or highway involve a waste of timber. There is also an economic loss of carrying and maintenance charges; a joint pole line in general repre-

VALUE OF POLES IN PLACE IN URBAN DISTRICTS

Standard Poles:

Size, Ft.	Basic Value	Annual Deduction	Value at Expiration of Successive Years: One	Two	Five	Ten	Thirteen	Value for Reciprocal Billing
25	$11.40	$0.71	$10.59	$9.78	$7.35	$3.30	$0.87	....
30	15.85	1.13	14.72	13.59	10.20	4.55	1.16	$21
35	21.90	1.56	20.34	20.34	14.10	6.30	1.62	27
40	27.15	1.94	26.21	23.27	17.45	7.75	1.93	33
45	32.65	2.33	30.32	27.99	21.00	9.35	2.36	39
50	38.45	2.75	35.70	32.95	24.70	10.95	2.70	44

Tank-Treated Poles:

Size, Ft.	First Five Years	Annual Deduction	Value at Expiration of Successive Years: Six	Ten	Fifteen	Twenty	Twenty-four	Value for Reciprocal Billing
25	$15.40	$0.77	$14.63	$11.55	$7.70	$3.85	$0.77	....
30	20.85	1.04	19.81	13.64	10.42	5.21	1.04	$26
35	27.90	1.39	26.50	20.92	13.95	6.97	1.39	33
40	34.15	1.71	32.44	25.61	17.07	8.54	1.71	40
45	39.65	1.98	37.67	29.74	19.83	9.91	1.98	47
50	47.45	2.37	45.08	35.59	23.73	11.86	2.37	53

sents a smaller investment on the part of each of the occupants than would be necessitated by a private pole line. The proportioned cost of maintenance of a joint line is also usually less. These gains are experienced especially where difficult tree or branch-line conditions exist.

Reliability of Service.—Joint lines in general carry heavier loads and consequently are often much more substantially guyed and braced than single lines would be. They receive more engineering attention in the stages of preliminary layout, are built with greater margins of strength and receive more frequent inspection and maintenance attention. As a result failures involving service interruptions are less frequent on joint lines than on solely occupied lines of comparable character.

Civic Betterments.—Considerations of civic planning, the general desire of citizens to save their trees and have their highways look their best, economy of sidewalk space in business districts, objections of individuals to obstructed frontages, all these situations are often completely met by joint use as a substitute for separate pole lines.

Cost of Administration.—Any advantage accruing from reduced cost or administration is still considered a debatable question by some utility executives. It is not, however, a controlling factor. Joint use does prompt the keeping of more complete plant records, and these have their value in other directions. The general feeling seems to be that such intangible value as is gained justifies the increased cost of administration of the properties arising from the participation in joint use.

Spirit of Co-operation Necessary

It should be fairly evident that, supplementing all the contractual and design details, there must be a complete spirit of co-operation permeating all organizations participating in joint use of poles, extending from the executives downward to the groundman of the line gang. Communication and power circuits can live in such close proximity only if the owners of each recognize the limitations of the other's circuits and apparatus. This co-operative and co-ordinative spirit must be applied to immature plans for future extensions of distribution systems as well as to immediate projects if the full benefits of joint use are to be derived. The existence of this spirit in Connecticut in conjunction with the formulated procedure just described accounts for the satisfactory functioning of more than 5,000 miles of jointly used lines of poles.

New Swedish Transatlantic Radio Station

THE large new transatlantic radio station at Varberg, Sweden, which was constructed at an approximate cost of $1,350,000, has just gone into commercial operation. The sending station has a wave length of 18,000 meters and is equipped with two high-frequency generators developing an energy of 200 kw. The electric power for the station is supplied by the waterfalls at Yngaredsfors and Trollhättan. The antenna construction consists of six masts from 110 meters to 130 meters in height, and the total length of the antenna is 2,300 meters. The receiving station is at Kungsbacka. Experiments have been made with the receiving apparatus and very satisfactory results were obtained.

Answering Government Ownership Propaganda

Interview with President J. F. Porter of the Kansas City Power & Light Company, a Pioneer in the Utility Field

BY ALLEN M. PERRY
Western Editor ELECTRICAL WORLD

SOME lessons learned from the election seem to have been pretty well expressed by President J. F. Porter of the Kansas City Power & Light Company in a recent interview which covered topics of interest and value to many utilities. His opinions on the proper way of combating government and municipal ownership propaganda are particularly pertinent and valuable. Mr. Porter began by observing in reply to a question: "I think it would attribute unjustified weight to the arguments against regulated private operation for electric light and power utilities to unite forces in combating government ownership propaganda by debating publicly and extensively the uneconomic, unfounded and even vicious arguments which are being forced on an unsuspecting public. I believe the majority of the public is inherently fair and will not pass judgment on hearing only one side of an argument and therefore will not believe all the untruths which are told about private operation by political propagandists."

"Well, how would you suggest handling this situation, assuming that you could address all utility executives?" was the natural rejoinder. Mr. Porter's recommendations were simple and apply equally well to the entire public relations problem. They are as follows:

"Every individual utility should remember that it not only has control of its own fate but can seriously hamper the entire industry if it does not conform with modern ideas of rendering a public service. Each utility should give service in every sense of the word. First of all, provide a reliable source of energy and means of transmitting it to the customers and furnish this energy at the lowest rates which will bring a reasonable profit. Make it agreeable and convenient for customers to apply for service; handle service connections as promptly as possible; make the reading of meters and paying of bills as agreeable and convenient as possible to the public, and always stand ready to handle sympathetically any grievance which a customer may have. Go farther than this by seeking every opportunity to show the customer how he can use his electrical equipment with the least operating expense.

"To make its relations with the public as harmonious as possible, each utility should start at home to educate its employees regarding its aspirations and ideals in public service. By example they should be shown the value of courteous, sympathetic treatment. Loyal employees are a company's best missionaries in times of need. Employees should be impressed with the fact that they will be serving their nominal employers only when they recognize and apply this fact. They should be informed that the public has the right to know anything it desires about the utility which is serving them, but care must be taken to avoid disseminating incorrect information. Hence the employees must be informed. Mutual understanding eliminates distrust and inspires confidence."

At this point Mr. Porter stopped to explain that these principles are not new and that utilities in the

last few years have been applying them in part or in full to overcome public prejudices which were inherited from wrong beginnings. "These principles," he pointed out, "are just as applicable to solving the national political question of whether utilities should be privately or politically owned and operated as they are to the local question of public relations in general. The chief difference is that the national problem cannot be solved unless each utility fulfills its obligations."

Among other valuable advice, Mr. Porter had the following to contribute:

"To permit offering the lowest rates feasible and at the same time to make it possible to earn an adequate return, utilities must keep down the investment in plant, but not to the point where it will hamper service or future extension. It should not be forgotten in the scramble for new holdings that courts will only allow a return on the value of the properties. Hence the increased price of any property due to several changes of ownership may be prohibitive when it is considered that only the actual value of the property may bring a return. Investments must be so made that the sum of fixed charges and operating expense will be a minimum. A penurious policy in investing new capital may make operating expenses higher than a more liberal investment, whereas too large an investment may not bring a proportionate reduction in operating expense.

"Co-ordinate with the proper policy in investing new capital should be an ever-vigilant watch for means of effecting new economies in the use of equipment. It is my belief," declared Mr. Porter, "that some basis of rating utilities can be established on which their rate of return can and should depend. It should include factors which are a measure of efficient management and service. Such a basis, if it allows higher return for the better-managed utilities, would encourage the best economy and service to the public.

"Utilities must recognize," continued Mr. Porter, "that unless adequate depreciation and obsolescence funds are set aside, new capital will have to be invested to replace old or obsolete equipment and on this capital the public will have to pay interest charges. Although courts have recognized that a utility is entitled to a return on capital invested in useful equipment, it will be to the advantage of utilities to educate the public to the fact that they will be benefited by lower rates if the utility is permitted to set aside adequate depreciation funds.

"After all of the foregoing requirements have been met, and not until then, it is time for utilities to sell their securities to their employees and the public to make them feel they have an interest in the company. In so doing, however, a utility must guard against issuing any security which has not equity in the plant back of it. It is not sufficient to issue a preferred stock which will assure dividends ahead of all other stock. The security must have a lien on the property and be protected against fluctuations in market value by having some tangible value equal to the face value of the stock back of it. Unless it does, customer ownership of such stock is liable to develop more ill will than it does good will. When such precautions are taken, I firmly believe customer ownership of securities will serve as a foundation for enduring good relations."

After having expressed himself in this manner, Mr. Porter turned to the interviewer and asked: "With good service, reasonable rates, public understanding and customer ownership, does any utility need to go stump-speaking to show the fallacy of government ownership of utilities?"

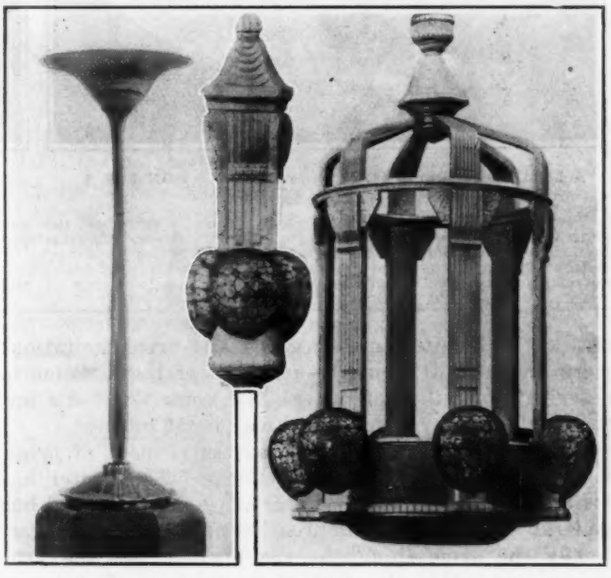
Letters from Our Readers

Modern Luminaire Design

To the Editors of the ELECTRICAL WORLD:

There has just been held in Paris an exhibition of luminaires which I believe warrants comment in the American electrical industry, because it is an indication of the fundamental modification of attitude toward luminaire design long recognized as desirable. In other words illuminating engineers and also architects have been appealing for the design of luminaires on modern lines to fit the electric light rather than mere copying of olden lighting-fixture designs developed in the day of the candle.

The exhibition I refer to was held in connection with



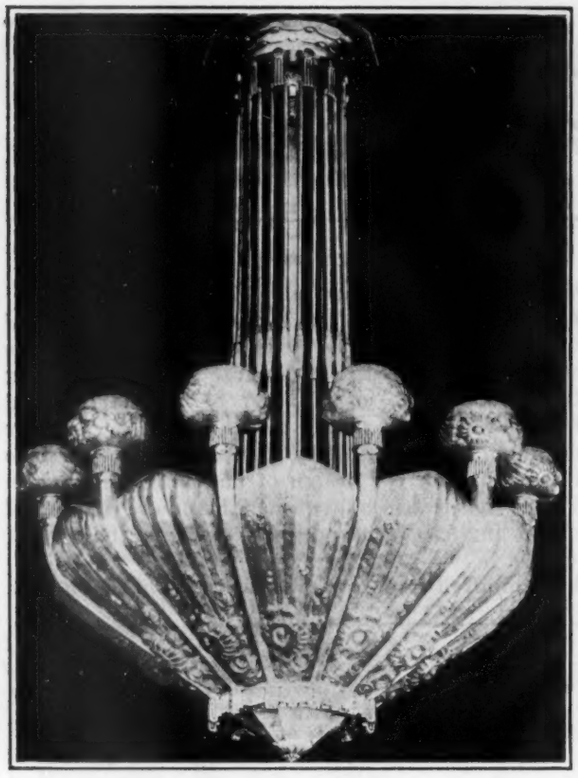
ORIGINAL LUMINAIRE DESIGNS AT THE PARIS SALON

The severe lines of the portable lamp shown at the left, designed by L'Art Du Bronze, give it a distinct appeal. The lamp is concealed by a marble bowl having striations of color that are most attractive.

In center and at right are ceiling and wall luminaires of unique design entered by Simonet Frères. The glass diffusers have a pressed conventional floral design toned a rather deep rose. The design of the metal work is distinctly modern in tendency.

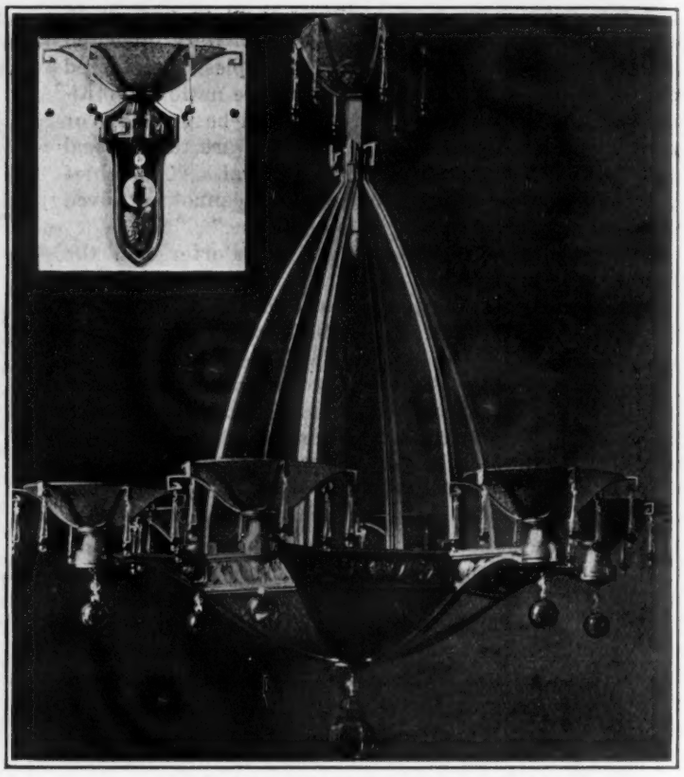
the Paris Salon of 1924. This Salon included a luminaire exhibit, and to stimulate interest on the part of the luminaire designers a "Grand Concours du Luminaire Électrique" was organized by the industry, the joint sponsors being the Union of Electrical Associations, the Association of Manufacturers of Bronze and Other Metals and the Society for the Encouragement of Art and Industry. To have a piece of work accepted for the Salon at all means a distinct step forward in one's artistic career, and in addition the joint sponsors arranged to have prizes totaling 50,000 francs available for the luminaire exhibit.

The contest was divided into three groupings: (1) Rural and inexpensive houses; (2) medium-priced houses; (3) expensive houses ("habitations riches"). There were certain other requirements as to what



A LUMINAIRE DESIGNED BY GENET & MICHON FOR A "HABITATION RICHE"

The luminaire at the left consists of a central semi-indirect portion of ample size, made up of sections of slightly diffusing, richly decorated pressed glass. This is surmounted by twelve smaller upright reflectors of the same type and design of glass. The metal work is simple and dignified in design.



CEILING AND WALL LUMINAIRES WHICH HARMONIZE, EXHIBITED BY RAINGOT FRÈRES

In the designs in the inset and at right the sections of glass are of rose tint and stippled to give diffusion. The pendants of glass are unique and an attractive feature. The slightly conventional lines of these luminaires are such as to harmonize with most interiors.

should be exhibited in each group and price limitations were set also. It would be quite out of the question to describe in detail all of the exhibits, some 175, but a few comments and my impressions may be of interest.

The most striking feature was the element of originality evidenced by many specimens. The writer has visited many exhibits of "fixtures" in America and has generally left with the impression of having seen practically the same thing the year before and the year before that. One also feels that each manufacturer is striving to do just what the others are doing, that one is literally afraid to get off the beaten track. There will be hundreds of samples, each embodying the same general principle as its neighbor, with only minor variations in structural details, decoration and color. This is not strictly a personal impression, for editorial comment in the technical and trade press and remarks of visitors to the annual "Fixture Show" have in general expressed this view.

At the exhibition under consideration, however, there was a very wide range of types, with very little similarity between competing specimens. Some designs, it is true, were fantastic according to our present standards. Others were of a type which did not permit reasonably effective utilization of light and a few did not give adequate diffusion or properly shield the eye. Some might justly be criticised by the architect or person versed in the history of ornament. Leaving aside these minor features, most of which could be corrected by slight alterations, one felt that here at least was a group of designers who had ideas. They have not slavishly copied the candlestick type of luminaire, because the artisans of the eighteenth century were forced to use tallow candles for lighting. They have realized that with the development of the art of illumination new forms of illuminants are now available and that these make necessary new types of luminaires.

While this exhibition does not show that the end has been attained, yet one feels that there is a sort of groping about for something, perhaps intangible in nature, but nevertheless a process of evolution is under way.

I am inclosing a few photographs of some of the luminaires as a graphic illustration, though naturally not fully effective, that progress is under way. It is a subject to which the entire lighting industry in the United States could, to its advantage, pay much more serious attention.

A. L. POWELL.

Paris, France.

Mathematical Proficiency Versus Mechanical Experience

To the Editors of the ELECTRICAL WORLD:

The editorial in your September 27 issue entitled "Buy the Best Available" was excellent, but your friend who advocates "no repair shop" will come to grief sooner or later, as repair shops will increase as long as our designing engineers are selected for their proficiency in mathematics instead of their mechanical experience. Why do nationally known firms put appliances on the market without considering how maintenance repairs may be made? For example, an oscillating fan is installed with its cord attached to windings in an inaccessible place. The fan will last as long as it is lubricated, but the cord must fail after a few seasons.

Wilmington, Del. WOOD WILSON.

Central Station and Industrial Practice

Successfully Drying Out Mine Motors

AFTER being completely under water for a period of five days, five 1,000-hp. pump motors in the mine of the Glen Alden Coal Company in the Lackawanna Valley were successfully dried out and placed back in service. A flood from the Lackawanna River entered one of the collieries at the rate of 700,000 gal. per minute. The Hampton water-shaft pumping station served this draining area with five centrifugal pumps driven by five 1,000-hp., 2,200-volt, three-phase, 60-cycle, 870-r.p.m. induction motors. In spite of the large capacity of the pumps, at the end of six hours the pumps and motors were completely submerged, and the water finally rose about 25 ft. over their tops.

It was five days before one of the pumps could be reached, and the pump and motor were found half buried in mud and silt, several hundred tons of which had to be removed before the pump could be placed in operation. One by one the motors were disengaged from the pumps and taken outside, with the exception of the motor on the pump farthest in the mine working.

These motors were disassembled, cleaned off with a fire hose and dried in a temporary wooden inclosure built around them. This building was open at the bottom and ventilated at the top, and a temperature of 90 deg. C. was maintained by circulating steam through coils of piping. This arrangement required little attention and gave constant temperature.

The motors were dried for a period ranging from seven to eleven days until meter readings showed a constant value for a period of twenty-four hours or longer. After being thoroughly cleaned out, painted and the swollen slot wedges trimmed, the armature windings were put back and the motors placed in operation again. They have been in service since this time and have given no trouble.

One motor which was left inside the mine was covered with a wooden house and dried by space heaters. Small fans gave necessary ventilation. This motor required closer attention and took longer to dry than the other motors.

The starting panels, oil switches and all other apparatus were put in service after being cleaned and dried by blowtorches and space heaters. The only failure of the entire outfit was a short piece of cable stretching from the busbar to the oil switch.

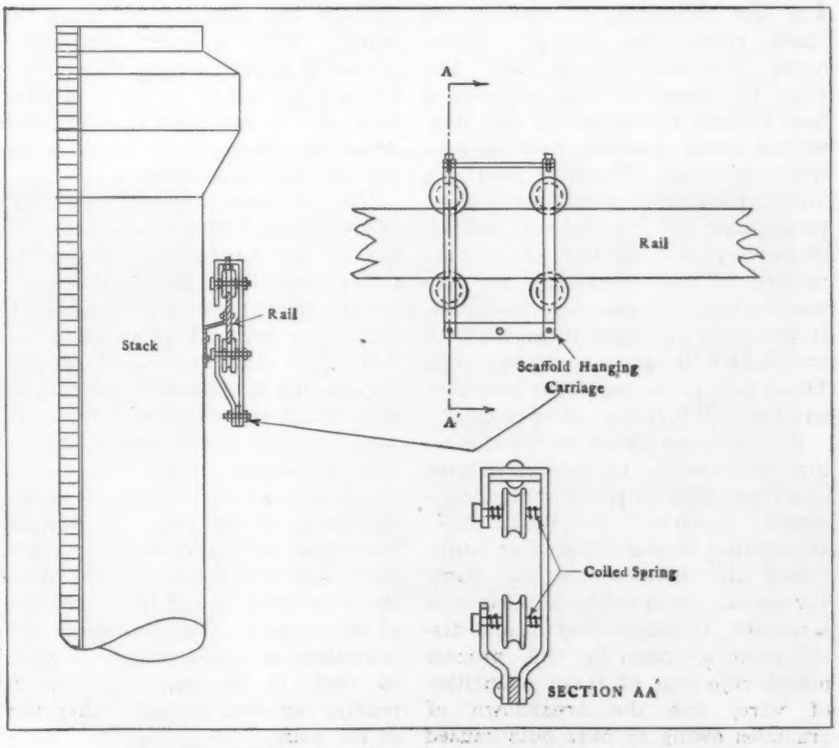
Facilitating the Painting of Power-Plant Stacks

By R. D. Gillespie
Plant Superintendent Dayton (Ohio) Power & Light Company

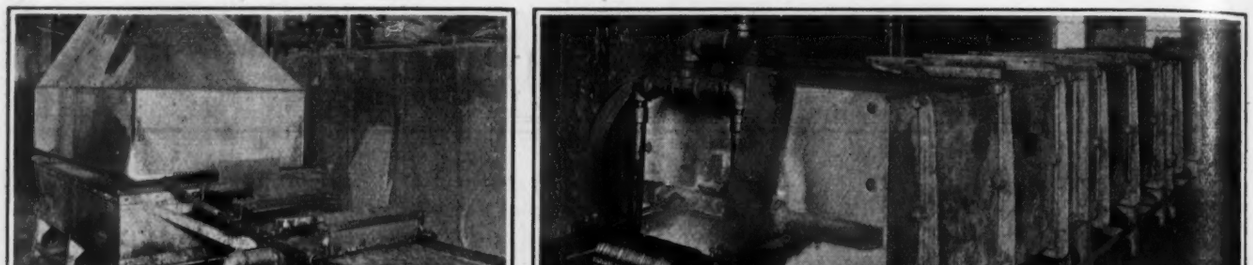
TO FACILITATE the painting of steel power-plant stacks, which must be done quite frequently in some localities if they are to be kept free from corrosion, the Dayton Power & Light Company has installed permanently around the top of its stacks at the Millers Ford station a rail from which the painters' scaffold can be suspended. To be used in conjunction with this rail a carriage was constructed comprising a strap-iron frame with self-aligning rollers which will run along the rail freely despite its curvature. The accompanying illustration shows the nature of the supporting rail and the scaffold carriage.

In brief, the rail consists of ½-in. by 8-in. steel plate that encircles the top of the stack. Riveted to it is an angle iron which in turn is riveted to the top of the stack. As indicated by the illustration of the scaffold carriage, it has four rollers, two of which run on the upper edge of the scaffold-hanging rail, the two lower rollers pressing upward against the lower edge of the rail. Once the carriage is placed on the rail, there is no opportunity for it to come off accidentally because of the flanges on the rollers and the elimination of any appreciable up-and-down play in the rollers. To remove the carriage from the rail it is necessary to remove the bolts which serve as axes for the two lower rollers. Self-alignment is afforded by allowing the rollers to slide along their axes, but this motion is restrained by helical springs coiled around the axis and pressing against washers at each extremity.

The scaffold proper is supported by a block and tackle from the cross-bar at the bottom of the carriage so that



RAIL FOR SUSPENDING PAINTERS' SCAFFOLD FROM TOP OF STACK



ELECTRIC FURNACE PROVES VERY SATISFACTORY IN HEAT TREATING STEEL WIRES

it may be raised and lowered. To permit horizontal movement around the stack one of two methods will probably be adopted. One consists of a line encircling the stack, passing by the painter's seat and attached to the ladder running up one side of the stack. It is anticipated that when the painter is suspended a considerable distance below the carriage this method of moving the scaffold horizontally will not be sufficient to move the carriage on the rail at the top of the stack, in which case two lines may be attached to the ladder just above the rail, stretched horizontally to pulleys on the carriage and allowed to hang down the full length of the stack so that the painter may propel himself to the right or left.

Electric Furnace for Heat Treating Steel Wire

BY R. H. MACGILLIVRAY
Industrial Heating Engineer Westinghouse Electric & Manufacturing Company

IN ORDER to gain the best results in the production of springs for shade rollers the Stewart Hartshorne Company found that the wire for these springs required a final process of hardening and tempering under positive heating control conditions. The wire used is a high carbon steel, containing a small percentage of manganese, silicon, phosphorus and sulphur. In the old method of heat treating the wire was hardened in cast-iron lead pots. It was then quenched in an oil bath and drawn in additional lead pots. These pots were heated by producer gas manufactured on the premises.

Results were never very satisfactory because the heating conditions could not be accurately controlled—actual variation in temperature alone being 25 deg. F. plus or minus—and also because the gas flame burned out the crucibles at least once a month. Improper control and distribution of heat by this process meant rejection of large quantities of wire, and the breakdown of crucibles owing to burn-outs caused loss of production and material and the labor of rebuilding furnaces.

About one year ago an electric furnace was installed for doing this work. After a short preliminary period of experimenting this electric furnace proved to be very satisfactory, and it has been in continuous operation twenty-four hours a day for the last six months.

This furnace consists essentially of two units. One is an electrically heated air hardening furnace approximately 18 ft. long with an electrically heated lead drawing pan, the quenching being done in oil as before. The other is a hardening furnace having a nickel-chromium retort with nickel-chromium resistance elements on top and bottom. This retort measures inside 13 in. in width and 2½ in. in height by the full 18 ft. of the furnace. Suitable insulation and refractory material surrounds this retort, filling up the space between it and the outer shell of the furnace. The furnace is self-contained and mounted on a stand so that, if necessary, it can be readily removed to some other part of the plant.

The lead-hardening pan rests in an insulated structure similar to the air furnace, but is open at the top. The wire is kept immersed in the lead by means of rollers at each end and for about 18 in. of travel.

The process is continuous. From ten to thirty-two strands of wire, depending on the size, are run through the air furnace, quenched in oil and drawn through the lead pan. The wire is oval-shaped, varying from 0.032 in. x 0.040 in. to 0.066 in. x 0.077 in.; the speed of travel ranges from 36 ft. to 48 ft. per minute.

Temperature control is automatic. Each 6-ft. section of the hardening furnace has separate control by means of electric pyrometers operating control panels connected on the primary side of auto-transformers. The temperature of the first and second sections is held at 1,800 deg. F. and that of the exit section at 1,650 deg. F. Recording charts on the pyrometers show that the temperature variation is very small.

Control on the lead pan is identical equipment, except that only one control is used and the temperature is maintained at 710 deg. F.

The connected load of the hardening furnace is 61 kw. and of the tempering pan 19 kw. Both operate at comparatively low voltage through 220-volt transformers.

Actual tests show an over-all operating consumption of 48.5 kw.-hr. for both units on continuous production. Power is purchased from the local central station at a sliding scale of rates, which averages about $0.02 per kilowatt-hour for the furnace operation.

The cost of 100 lb. of finished wire follows:

	Labor and Fuel	Fuel
Producer-gas furnace ...	$0.858	$0.381
Electrically heated furnace	0.53	0.26

A saving of $0.328 per 100 lb. of wire has been made by installing the electric furnace. The results are always uniformly good with practically no rejections of wire. The saving in labor and material has also been considerable. In six months of continuous operation the electric furnace has not required any repairs.

In this period the gas furnace would have been shut down about nine times for repairs.

The electric furnace takes up less floor space than the gas furnace and has twice the production. Since installing the electric furnace the company has been able to shut down two gas furnaces and still maintain necessary production.

Lead-Sheath Cable for Street Lighting

BY J. HILL, JR.
Assistant General Superintendent Southwestern Gas & Electric Company, Shreveport, La.

APPREHENSION has usually arisen when any one has suggested the use of unarmored or unprotected underground cables for street lighting, but 600-volt rubber-insulated, lead-sheath, single-conductor cable without any mechanical protection has been used in Shreveport on 6.6-amp. street-lighting circuits for several years without any objectionable experiences. At present about 15 miles of such circuits are installed, and there have never been more than five interruptions a year.

In grass plots and in parkways a trenching plow is used to cut a trench 16 in. to 18 in. deep next to the curb. This trench is cleaned out with a shovel and the cable is laid therein and covered with earth. At crossings, or where it is expected that water or gas services will have to be laid eventually, the cable is protected by steel conduits. Along concrete-paved streets it has been found very convenient to cut a trench 3 in. deep in the concrete next to the curb with an air chisel. In this trench the bare cable is laid and covered with 1 in. of sand and concrete over all.

Simulation of System Short Circuit

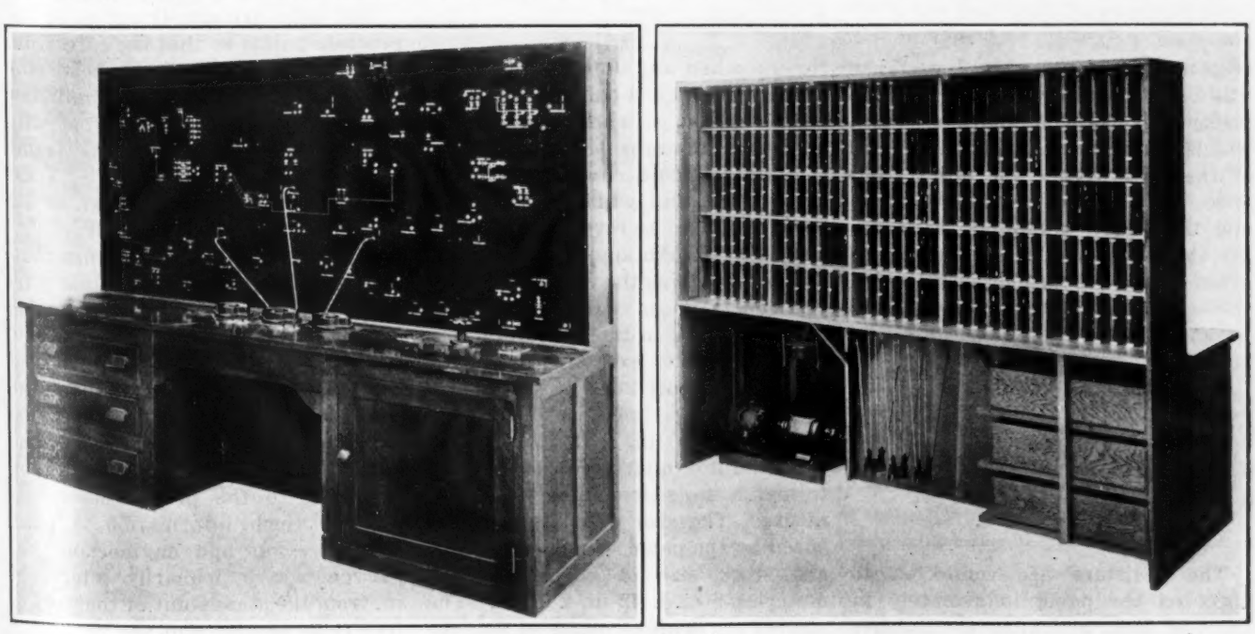
Construction Details for Building a Calculating Board Are Given—Total Cost Approximately $800

BY R. C. DENNY
Operating Engineer San Joaquin Light & Power Corporation, Fresno, Cal.

THE problems incidental to the adequate protection of a large power system against internal troubles, as well as those imposed by the elements, become quite complex when the system increases in generating capacity and in extent of transmission lines. Continuous and reliable service is contingent upon proper selective action of relays and the subsequent behavior of the circuit breakers or switches upon opening.

The idea of a calculating board with the San Joaquin Light & Power Corporation dates back perhaps ten years, but it has only been in the last year that the idea has materialized. The older idea was that of a three-phase phantom system, a costly and complicated scheme that eventually gave way to the comparatively simple direct-current-operated board. For the information of other companies that may be considering such a board some data for comparative purposes may not be amiss. The San Joaquin company operates over a territory approximately 200 miles square. There are fourteen generating stations, totaling approximately 145,000 kva., tied in on an interconnected transmission network of virtually 1,400 miles operating at 110 kv., 69 kv. and 33 kv. The system generating capacity is augmented by about 55,000 kva. available through interconnections with adjoining systems. There is also an 11-kv. distribution network even more extensive than the transmission lines but which is not concerned in the board.

As in most modern calculating boards, it is the reactance values of the individual generating units, transformer banks and line sections that are represented by resistance units. The error is thus on the safe side as the current indicated on the various short-circuit tests will be in excess of what it would actually be in the case of line troubles. As it was the desire to operate the board at one certain voltage, the reactance values in the case of the San Joaquin board



SHORT-CIRCUIT-CALCULATING BOARD BUILT BY SAN JOAQUIN LIGHT & POWER CORPORATION

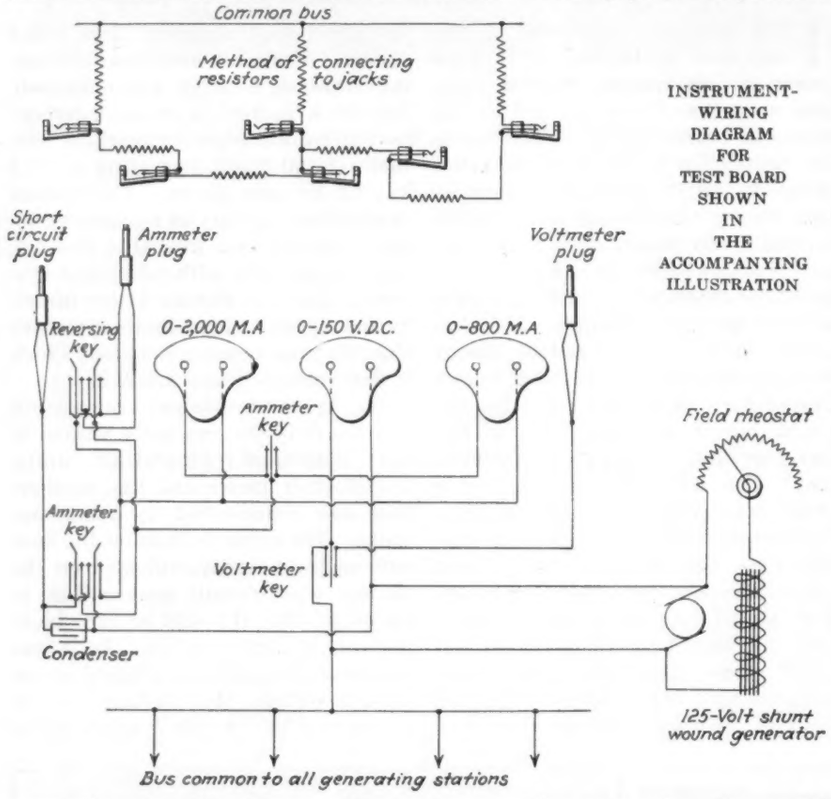
were reduced to terms of 69 kv. or 40.1 kv. to ground, which is really the extensive part of the transmission system and that upon which most troubles occur. The resistor units are of fixed-resistance values and are of the vitreous-enamel type, 131 of them in all, mounted end on end between the shelves, as shown in the accompanying rear view of the board. The resistors are held in place by copper rods passing down through them in groups of five each.

The selection of the unit resistance value or actual resistance value corresponding to 100 ohms reactance was based on the rated carrying capacity of certain standard resistors which were very desirable on account of their low cost. The unit resistance value chosen was 750 ohms, and the range of actual resistance for the different classes of units is given in the tabulation below:

RANGE OF ACTUAL RESISTANCE

Classes	Number	Ohms of Resistors
Line sections	79	9.8 to 774.9
Generators	12	375.0 to 1447.5
Synchronous condensers	3	1980.0 to 3015.0
Power-house transformer banks	13	157.5 to 510.0
Substation transformer banks	16	60.0 to 1200.0
Generators and transformer banks combined	8	1192.5 to 3232.5

The resistors are connected to jacks on the panel immediately in front of them and after the manner shown in the wiring diagram. These jacks, some 170 in all, are of the closed-circuit type, the springs being separated when a plug is inserted. Three plugs are used, one for simulating short circuits, one for series readings in the several branches contributing to most "shorts," and the third for measuring voltage drop on "shorts" and testing for resistor troubles or "opens." The jacks used were chosen for their sturdy design and simplicity of mounting. They have unusually heavy bronze springs which insure positive low-resistance contact. Dummy plugs are provided for use when any unit or line on the system is switched out of service. By means of key switches either of two milliammeters may be switched into the short-circuit cord or the line series cord, and while in the latter the current may be reversed by a third key. The fourth key is for the purpose of switching the voltmeter across the generator or onto the cord for measurements on the board. A condenser prevents excessive arcing on the short-circuit key.



INSTRUMENT-WIRING DIAGRAM FOR TEST BOARD SHOWN IN THE ACCOMPANYING ILLUSTRATION

The cabinet itself is of over-all dimensions, 30 in. x 72 in. x 96 in., and is built of quartered oak, finished to match the surrounding office furniture. The size was largely influenced by the panel, which is a standard stock size of ebony asbestos material, ¼ in. x 42 in. x 96 in. The shelves are made of maple so that the cabinet is a very substantial piece of equipment. There is ample drawer room in one end, while a cupboard in the opposite end with a large door gives easy access to the power unit housed therein. This unit is a motor-generator set composed of a ½-hp., 220-volt, 1,750-r.p.m., single-phase motor directly connected to a ⅓-kw., 125-volt shunt-wound generator. The unit rests on felt strips on the concrete floor and is not objectionably noisy. The bench part of the board is 30 in. high and 20 in. wide, and mounted on it are the meter equipment, keys plugs, rheostat and flush switches. Two milliammeters are used, one having a scale 0-2,000 and the other 0-800. The third instrument is an 0-150 voltmeter.

The transmission system was laid out on the panel to be as nearly geographical as was practicable, to facilitate comprehensive observations. The lines were ruled on with showcard writers' ink, different colors being used to designate the different voltages. After the ink had become thoroughly dry the entire face of the panel received a coat of transparent varnish. The holes for the jacks were then drilled, after which the panel was fastened in its permanent position and the jacks were mounted. One terminal of each of the resistors representing generators and synchronous condensers is connected to a common bus leading directly to one terminal of the 125-volt generator. The other terminals of such resistors are connected to resistors representing their respective transformer banks and those to the line resistors, etc.

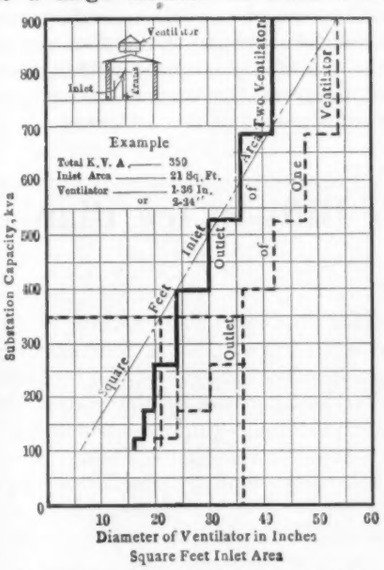
The jacks are simply cut in at the junction points so that the cord from the other terminal of the generator which is in series with the milliammeter may be plugged in at any junction point, completing the circuit and simulating a "short." Total short-circuit currents as high as 1.2 amp. have thus been obtained.

The current indicated is then multiplied by the constant for that particular part of the transmission system, which is 2,500 for the 69-kv. system, with the test voltage held normal at 120 volts. This gives the instantaneous value of the short circuit in amperes, from which the time decay values may be estimated by referring to the proper decrement curves. Such information is what the operating and engineering departments are primarily interested in, from the standpoint of the protective relay system and the rupturing capacity of switches.

The board is installed in the load dispatcher's office on the seventh floor of the corporation's new office building at Fresno, Cal., where it is available for the use of the operating and engineering departments on the same floor. The cost of this board was approximately $800, which is considered to be very moderate for any single piece of equipment so important to a system.

Ventilating Transformer Vaults Systematically

THE question of proper ventilation for transformer vaults is continuously confronting central-station companies supplying energy to a large number of small com-



NATURAL VENTILATION FOR TRANSFORMER ROOMS 9 FT. HIGH

panies. In many instances the contract can be drawn to control the conditions under which the vault will be built, so that the engineering department of the companies will have virtually a standard room height with varying floor area and transformer capacity to work with. With these conditions a standard rule for ventilating the vaults may be made by fixing the temperature rise above incoming air, this being based on the average for the warmest months of the year, depending upon location.

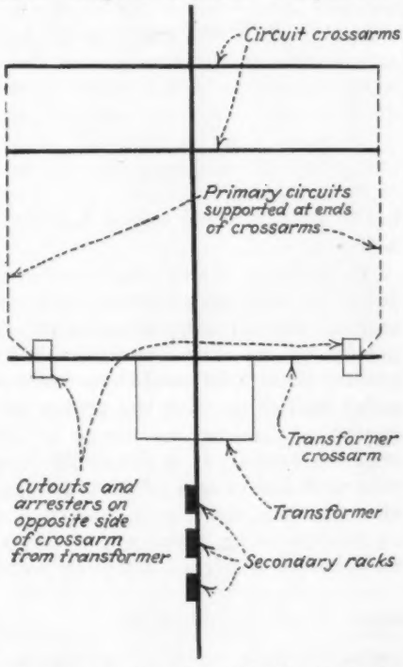
The chart shown in the accompanying illustration is now being used by one large power company. This chart is based on a temperature rise of 10 deg. C. The designer by the assistance of this chart can readily determine the size of inlet and number and size of ventilators. The inlet area is corrected for louvers and screens to prevent birds and animals from entering the vault, also to keep rain and snow out of the room.

Uniformity of Transformer Mountings Favored

By J. C. Dodds
Superintendent of Distribution, Houston (Tex.) Lighting & Power Company

WHEN transformers larger than 25 kva. are to be mounted on poles, the construction shown in the accompanying illustration is employed by the Houston Lighting & Power Company to obtain uniformity of appearance, clearance of circuits and minimum bending moment on poles. As may be observed, the transformers are hung from cross-arms so that they will be from 18 ft. to 20 ft. from the ground. The primary circuits are brought down from the upper cross-arms and on insulators attached to the ends of the cross-arms. On the ends, but on opposite sides of the transformer cross-arms, are mounted the primary cut-outs and arresters.

The scondaries are supported on racks and not on the cross-arms, being grounded at every pole by a 10-ft. ¾-in. galvanized-iron pipe and No. 2 wire. Separate grounds are used for the primary and secondary circuits. The foregoing type of ground has been adopted because comparative


Circuit crossarms
Primary circuits supported at ends of crossarms
Transformer crossarm
Cutouts and arresters on opposite side of crossarm from transformer
Transformer
Secondary racks

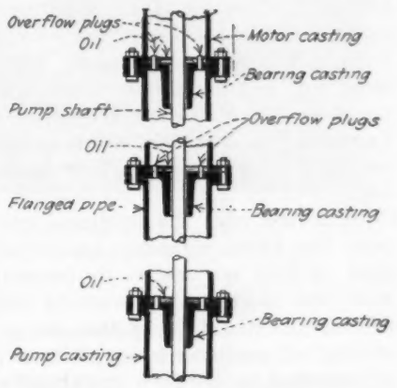
SCHEMATIC IDEA OF MOUNTING TRANSFORMERS IN HOUSTON

tests showed it to have a resistance of only 4 ohms compared with 65 ohms for a coil of wire buried at the foot of the pole and 840 ohms for a 5-ft. ¾-in. galvanized rod.

Protecting Hot-Well Pumps Against Flood Waters

By R. H. Forney
Superintendent of Power Plant, Dallas (Tex.) Power & Light Company

HOT-WELL pumps on one of the steam-generating plants of the Dallas Power & Light Company are driven by vertical-shaft motors mounted on the floor of the turbine room. Since lubrication of the in-



ARRANGEMENT OF BEARINGS AND SHAFT CASING FOR VERTICAL-DRIVE HOT-WELL PUMPS

termediate bearings has always been a problem, especially if they were subjected to flood waters, a tubular inclosure was constructed for each shaft with bearings interposed at proper intervals, and arrangements were made to lubricate them from the turbine-room floor. The accompanying drawing illustrates what was done.

The bearings are made with flanges which can be bolted between the sections of flanged piping or between the ends and the motor or pump in order to make a water-tight inclosure from the pump to the motor. These bearings are oiled entirely from the engine-room floor. To permit this two holes are provided between the upper and lower faces of each bearing flange and fitted with overflow plugs which maintain a slight head of oil on each bearing but permit any excess to run into the bearing below.

No oil rings are provided in the bearing sleeve, since the small head of oil produced has been found sufficient to lubricate the bearings sufficiently. Because of the double overflow plugs there is not much chance of oil failing to reach any of the bearings. However, if it is ever necessary to attend to the bearings, the shaft casing can be easily removed by loosening the bolts which fasten the sections and intermediate bearing-casting flanges together.

Central Station Business

Utica (N.Y.) Company Will Sell Appliances

FURTHER evidence of the desirability of the local central-station actively selling electrical appliances is seen in the recent action of the Utica (N. Y.) Gas & Electric Company in acquiring the store and business of the Heating & Appliance Company, located next door to the central-station general office building.

In taking over the appliance concern the Utica company announced that it had no desire to compete with the electrical contractors and dealers in the city, but that by operating an appliance store of its own it expected to improve merchandising conditions, which will result in increased sales by all dealers and consequently better service to the public.

Special demonstrations and intermittent sales campaigns carried on by the company in the past have proved very effective, but they have not had the advantages of continuous effort, and the company therefore felt that the only method whereby it could render full service to its customers was by actively engaging in the sale of electrical appliances.

Outlook for the Domestic Refrigerator Load

THE year 1924 apparently has been the turning point for domestic electric refrigeration and present conditions indicate that 1925 should see a more general acceptance of the equipment by the central-station companies. The accompanying tabulation shows the status of this business in several typical cities in the country. In the five large cities almost one million dollars have been invested in domestic electric refrigerators during the last twelve months, and it is interesting to note that in Kansas City alone, where there are about five hundred machines connected to the lines of the Kansas City Power & Light Company, 80 per cent, or four hundred of them, were placed in the last twelve months.

While central-station companies for a number of years have been looking for a satisfactory domestic refrigerator which they could conscientiously offer to their customers, they have refrained from actively pushing any such device because of the shortcomings of the machines then on the market. The fact that nearly one-third of the total number of machines in use in the five cities were sold within the last year tends to show that many of the former difficulties have been overcome to an extent at least where the central-station company can offer an adequate maintenance service at not unreasonable cost. The load-building and revenue-earning possibilities of the electric refrigerator are well known, and with a rapid increase in the number sold, manufacturers should be able to bring the cost of the individual machine within reach of many of the central-station companies' residential customers.

DOMESTIC ELECTRIC REFRIGERATORS IN USE IN FIVE CITIES

City	Total No. of Domestic Refrigerators on Lines	No. Machines Sold in Last Twelve Months	Retail Value of Machines Sold During Past Year	No. Ice-Cream Cabinets in Use
Kansas City	500	400	$120,000	175
Chicago	2,000	265	79,500	*
Baltimore	1,250	640	192,000	*
Detroit	6,087	1,225	367,500	2,100
Boston	1,200	400	120,000	*
Total	11,037	2,930	$879,000	2,275

* No data available from these cities.

Causes of High Power Bills in Ice Plants

By C. T. Baker
Consulting Engineer, Atlanta, Ga.

OWNERS and managers of electrically driven ice or refrigerating plants sometimes complain that the cost of power for operating their plants is abnormal or that it is considerably higher than they had anticipated at the time of deciding upon the electric drive. As a result of this condition, they are inclined to question the wisdom of their choice of prime mover and to feel that perhaps they might have done better if some other power had been selected.

There is no doubt that errors of judgment have occurred in many instances when selecting the kind of power to use for operating such plants, since local conditions have a great deal to do with the proper selection of the motive power to be used. However, it is frequently the case that the causes of high energy costs in the electrically driven ice or refrigerating plant might easily be removed if proper attention were given to operating details or, in many instances, by a comparatively inexpensive rearrangement of some of the apparatus or the installation of additional equipment which could be made at reasonable costs.

A few typical causes of high power costs in the electrically driven plant are given here with suggestions for their removal:

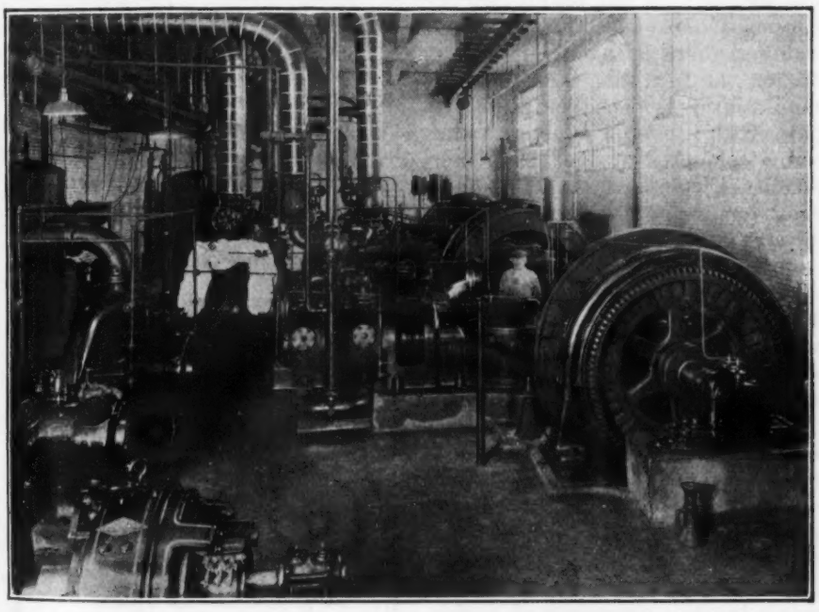
Many of the cases on record where abnormal energy costs prevail may be traced surely and quickly to the door of poor plant design or erection or both. Some plants in this classification consume 80 kw.-hr. or 90 kw.-hr. per ton of ice made when operating at full capacity, and others are known to have consumed as high as 100 kw.-hr. per ton at full capacity.

Contrast this with many plants which at full capacity produce a ton of ice on a consumption of from 48 kw.-hr. to 60 kw.-hr. and it is easy to understand the necessity for correct design and erection, if economy of power is to be obtained.

Some of the common faults of design often found in the electrically driven plant are insufficient ammonia condenser capacity for the work to be performed, insufficient condensing water, condensing water temperatures too high for economical operation, insufficient cans and coils

in freezing tank, necessitating operating the compressors at uneconomical suction pressures and low brine temperatures; poor piping layout, causing loss in capacity due to abnormal pressure drop; lack of proper tank insulation, absence of insulation on low-temperature brine and ammonia lines exposed to high air temperatures, etc.

It is, of course, obvious that such shortcomings are detrimental in any ice plant, regardless of the kind of power used. However, in the case of the electrically driven plant, with all energy accurately measured and recorded as consumed and a bill of costs rendered each month by the power company, the ice-plant manager or operator has his power costs brought to his attention at regular and stated intervals. On the other hand, in many steam-driven plants the power costs are not known until the close of the ice season, and the cost sheets are prepared covering the season's operation. The owner, therefore, cannot be so familiar with his power costs during the season as the man with the electrically driven plant who gets his monthly reminder regularly.



SYNCHRONOUS MOTOR-DRIVEN ICE PLANT—TOTAL INSTALLATION 3,000 KW.

Operating Methods

Aside from the inevitable power and capacity losses due to improperly designed and unbalanced plants, there are numbers of electrically driven plants in operation which are the last word in design and construction, yet have monthly power bills out of all proportion to the amount of ice produced.

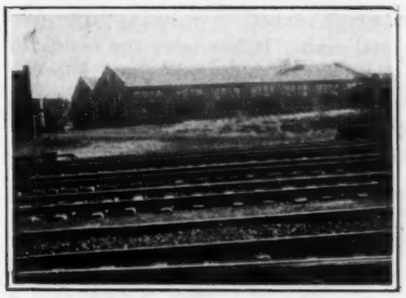
In searching for the causes of high power costs in such plants many reasons have been discovered.

The most common causes found are dirty ammonia condensers, noncondensable gases, air or other permanent gases in the system, insufficient cooling water, etc., all of which result in abnormally high condensing pressures and greater kilowatt-hour consumption per ton of ice produced. In addition to the above typical faults one frequently finds ammonia compressors being operated with leaky pistons or valves, or both, and too often in many plants there are found such conditions as insufficient charge of ammonia, neglect to keep the oil drained from the ammonia system, neglect of the air-piping system and air-tube connections at the ice cans, as well as neglect of the air compressors, to such an extent that air is wasted and additional power must be consumed in supplying air in sufficient volume to offset these leaks and maintain the correct pressure at the air inlet to the cans.

It is suggested that when central-station companies are confronted with high power costs in the electrically driven ice plant they make a searching investigation of the plants, checking up the items outlined above and at the same time checking up the power supply for voltage, transformer capacity, etc., thus getting a complete analysis of conditions as they actually exist. When one has facts to work with it becomes a comparatively simple matter to take the necessary steps for improving conditions.

Photo-Letter "Pulls" Sign Business

MORE than 50 per cent of a group of industrial plants recently circularized by the Edison Electric Illuminating Company of Boston in a letter calling attention to the value of factory electric signs have sent reply cards to the company's illuminating engineering division, and several new installations are in prospect as a result of the method of appeal used.



A PICTURE OF THE "PROSPECT'S" PLANT IS PASTED TO EACH LETTER

Letter Addressed to Electric Sign "Prospects"

Gentlemen: Your factory is fortunately located where thousands of people see it every day as they travel on the trains to and from the city. It offers an exceptionally advantageous location for an electric sign.

Edison Light does not build signs, but it does offer a free and expert service of advice on electrical advertising.

If the question of erecting an electric sign on your building has ever been considered, it may be that the project was dropped for lack of complete information as to the cost of a sign and its maintenance. Furnishing this information is a part of our service. The rest of the service consists in sending one of our sign experts to see you, to inspect your building for the best possible angle of sign location, and to furnish you with drawings and estimates of the type of sign most suitable for your own building and within the tentative range of cost you specify.

This service, we beg to repeat, is without any expense or obligation to you. The inclosed post card provides a space for you to set a time that will be most convenient for our representative to call.

We shall be glad to have you fill in the card and return it to us.

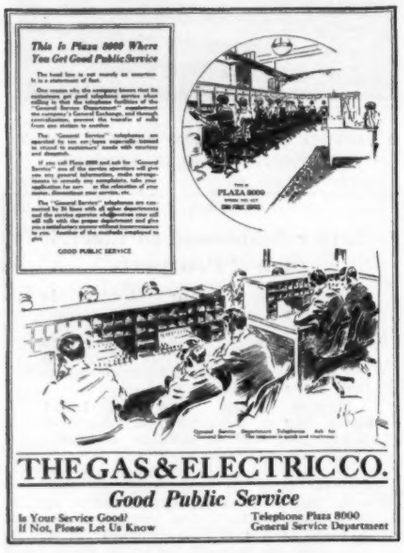
Sincerely yours,
J. DANIELS,
Illuminating Engineering Division.

Pasted on each letter is a 2¼-in. x 3¼-in. photograph of the particular plant addressed, showing how the establishment looks from an adjacent railroad. As the letter reproduced herewith shows, the illuminating engineering division offers its services in an advisory capacity in connection with electrical advertising, without expense to the recipient.

Transacting Central-Station Business by Telephone

BY R. F. BONSALL
Assistant Secretary and Assistant Treasurer Consolidated Gas, Electric Light & Power Company of Baltimore

USE of the telephone for transacting all kinds of business is to a great extent displacing the personal visit. It has been the endeavor of the Consolidated Gas, Electric Light & Power Company to make it as easy for the customer to do business with it as with any merchandising organization, and this was one of the ideas in mind when our geneal service department was established for the handling of complaints and inquiries and all relations with the public along this line. Under the supervision of this department there is a general service telephone bureau, separate from our application and emergency boards, where the customer may receive the same service as he would if he were standing at the counter. There are ten positions on this board—six in use regularly and four for peak days. This board is manned by six telephone service salesmen, with a reserve of four counter service salesmen.


This Is Plaza 8000 Where You Get Good Public Service
GOOD PUBLIC SERVICE
THE GAS & ELECTRIC CO.
Good Public Service
Is Your Service Good? If Not, Please Let Us Know
Telephone Plaza 8000 General Service Department

ADVERTISEMENT TO ENCOURAGE CUSTOMER'S USE OF THE TELEPHONE

The calls are placed on this board by our general telephone operators, who do a limited amount of questioning, and the inquiries and complaints so received cover almost every phase of the company's operations. Applications or trouble calls are handled here also, if once placed there by the regular operator—as the telephone service salesmen are instructed under no circumstances to transfer a call. The customer holds the line while the necessary information is obtained from the person or department involved by the salesman plugging in from his own board or through the general operator. If an unusual amount of investigation or time is required, the customer's telephone number is taken, and he is called later; but in nearly all cases the information is obtained while he waits, except where the explanation of a high bill is asked for, requiring reference to the meter reader's handbook, bill schedule, etc. The necessary information is then taken by the salesman, and the customer is told that one of our outside service salesmen will call to go over the case.

TRAINING SERVICE SALESMEN

The men on this board receive the same training in company policies and methods as our counter-service salesmen, and, in addition to this training, there is taken into consideration the fact that these men are handicapped by not being face to face with their customers, thus being compelled to get their personality across without the advantage of seeing what is passing through the customer's mind as they talk. These men, like the rest of our department organization, are familiar with the operations of the company and have been put through our regular educational courses; that is, have accompanied our shopmen through different phases of their work, have been with the other men of our department in their various operations and through other departments of the company to learn their methods.

The men on this board also arrange for any outages made necessary by maintenance work on the distribution system. After a common time is arranged for, the distribution department is notified. If it is more convenient to customers, the work is done on Sundays, holidays or it may be done any time during the night.

This board is also used to ascertain the class of service we are giving and the promptness with which orders are executed. Each day about 25 per cent of the various classes of orders executed the day before, except meters set, are distributed to these men, who during off-peak periods call the customers to ascertain if their complaints have been properly taken care of, if the repairs were made as requested, if certain goods were delivered satisfactorily, etc. A statement of these results is sent monthly to the various departments and acts as an incentive to better work.

We have had numerous expressions of satisfaction from customers of the service rendered over this board, which results in a saving of time, energy and expense to the customer and increases his good will toward the company. All indications seem to point to an expansion of this telephone service, necessitated by increasing appreciation on the part of our customers.

Appealing to New Investors in Utility Securities

TO INSPIRE the confidence of the investing public in utility securities the Louisville Gas & Electric Company is using a series of newspaper advertisements of which the accompanying illustration is typical. It is, in fact, an educational campaign to teach people that there is no need to keep their money hoarded when a substantial and safe return can be obtained. The advertising "copy" endeavors to show how money invested in utilities benefits the owner and the community while buried gold helps neither. The company has found that this type of advertising is very effective in obtaining stockholders, especially among persons who may have had no previous experience with investments.

Buried Gold
Made to Produce Incomes
WE have found that a considerable part of the money invested by our 6,000 home shareholders in new gas and electric construction never saw a bank—never knew safer deposit than a place under the carpet or in the soil of the backyard.
As much as $7,000 in small bank bills has been carried into our office in a market basket—covered with a red tablecloth—for investment in the 7% Preferred Shares of this Company. Thus particular accumulation, the savings of years, now pays the owner $490.00 a year.
Confidence in the stability of the Louisville Gas and Electric Company and its investment safety has induced many people to turn their non-productive and hidden savings into a form of wealth that pays them a substantial income as regularly as the four seasons of the year.
Buried gold pays no interest—earns no dividends—for the owner. Transform such hoardings into buried gas mains and electric conduits and they double themselves in 10 years, if the income is reinvested quarterly.
Idle money benefits no one. Money put to work in extending electric and gas service makes employment for people, carries labor-saving and lower-priced light, power and heat to additional families, helps the city to grow and pays the investor a good return.
Why Not Have a Talk With Our Investment Department?
Louisville Gas and Electric Company
Incorporated in Kentucky
85 Years of Consistent Returns to Investors

ADVERTISING TO INTEREST PEOPLE WHO HOARD THEIR CASH FUNDS

Digest of Electrical Literature

Generation, Control, Switching and Protection

Frequency Transformation. — W. DORNIG.—Currents of very high undamped frequencies, such as are needed in radio communication, can be obtained from comparatively low-frequency current by the use of iron choke coils, and the combination of several low frequencies with frequent phases or several currents of the same phase but different frequency. For example, two phase-displaced currents of 3,000 cycles each may be combined to give a 15,000-cycle wave. But the same wave of 15,000 cycles can also be produced by the combination of one 3,000-cycle and one 5,000-cycle wave train which are in phase. The author mentions a special type of generator, having one common field within which rotates a twin armature, giving two independent circuits for 9,000 cycles and 11,000 cycles. Combining externally these two circuits, frequencies of up to 99,000 cycles can be obtained. — *Elektrotechnische Zeitschrift*, Oct. 16, 1924.

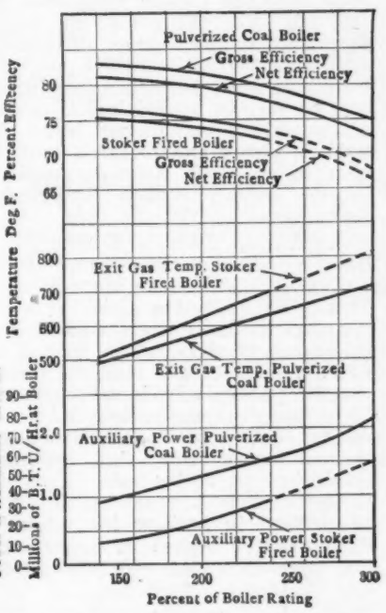
Repeated Thermal Expansions and Contractions: Their Effect on Long Armature-Coil Insulations.—T. S. TAYLOR.—Some differential effect may reasonably be expected in long-core generators because the co-efficient of expansion of copper is roughly 50 per cent greater than that of iron and of built-up mica and paper insulation, which are nearly equal. Tubular experimental coils were made up with standard 13,200-volt insulation, inserted in a set of slots 109 in. long and alternately heated by a current and cooled by forcing air or water through them. Thermocouples indicated the distribution of temperature along the stampings and conductors. After 11,537 heating and cooling cycles, some of them with a range of 160 deg. C., they withstood the application of 37,000 volts for one minute.—*A. I. E. E. Journal*, November, 1924.

Hydro-Electric Development and Steam Equipment

Foreign Practice in Vertical Water-Tube Boilers.—F. JOHNSTONE-TAYLOR.—This article contains descriptions and illustrations of several European types.—*Power Plant Engineering*, Nov. 15, 1924.

Fuel Consumption and Power Supply Economics.—HUGH QUIGLEY.—The object of this paper is to show the present state of power costs in Britain, with special reference to municipal undertakings. It is based on the returns for the year 1923-24 bearing on fuel consumption and thermal efficiency, which are compared statistically with those for 1922-23. The analysis is carried out in considerable detail, with load curves, and charts and tables for individual stations and groups. The author concludes that the medium-sized power station (20,000 kw. to 60,000 kw.) can be operated as efficiently as the large station and give equally as satisfactory results.—*World Power (England)*, October, 1924.

Pulverized-Coal Boiler Performance. — L. W. HELLER. — Operation for twenty-two months at the Brunot Island power station of the Duquesne Light Company has, according to the author's observation, shown certain advantages in favor of the use of pulverized coal—comparatively high efficiency without employment of highly skilled operators, ease and promptness of automatic regulation, long periods between outages for repairs, freedom


Pulverized Coal Boiler
Gross Efficiency
Net Efficiency
Stoker Fired Boiler
Gross Efficiency
Net Efficiency
Exit Gas Temp. Stoker Fired Boiler
Exit Gas Temp. Pulverized Coal Boiler
Auxiliary Power Pulverized Coal Boiler
Auxiliary Power Stoker Fired Boiler
Temperature Deg F. Percent Efficency
Power to Auxiliaries K.W.H. Millions of B.T.U. Heat Boiler
Percent of Boiler Rating

COMPARATIVE PERFORMANCE OF PULVERIZED COAL AND STOKER-FIRED BOILERS

from serious accumulations of ash on tubes and high evaporative capacities with low draft loss through the boiler. Diagrams and performance charts are given. The results of comparative tests on similar boilers with different methods of firing are shown in the accompanying illustration.—*Power*, Oct. 14, 1924.

Operation of 1,200-Lb.-Pressure Generating Unit at Weymouth. — E. W. NORRIS.—The distinctive features of the high-pressure unit in the Weymouth station of the Boston Edison Company are described and in part illustrated, including the boiler, special safety and telltale valves, piping and turbine. The initial steam pressure of the latter is to be variable, with a maximum of 1,200 lb. at 700 deg. F. The exhaust pressure is to be constant at 360 lb. per square inch, variable temperature. Provision is made for emergency stopping without producing abnormal pressures or temperatures anywhere in the steam circuit.—*General Electric Review*, November, 1924.

Transmission, Substations and Distribution

Outdoor Traction Substations.—Constructional features of 60,000/15,000-volt, 16⅔-cycle substations installed on Swiss railway lines, in connection with the rapid electrification going on in that country, are described and illustrated. The largest is rated at 15,000 kva. Particular features include surge arresters, consisting of horn gaps with earthing resistances and 200-amp., 1.2-millihenry choke coils; feeder circuit breakers which, when they operate, introduce a testing resistance and an indicator to show when the short circuit has ceased, and oil switches that limit the transient disturbances during switching by inserting two resistance steps of 2,500 ohms each.—*Engineer (England)*, Nov. 14, 1924.

Transmission at 220 Kv. on the Southern California Edison System.—A continuation of the symposium at the Pacific Coast convention reported in the ELECTRICAL WORLD for November 1.—*A. I. E. E. Journal*, November, 1924.

Simplified Slide-Rule Method for Calculating Transformer Efficiencies. — NORMAN LEE.—A method by which percentage losses can be rapidly worked out is described and illustrated by means of practical examples.—*A. I. E. E. Journal*, November, 1924.

Importance of Standards in the Evaluation of Insulating Materials.—LAWRENCE E. BARRINGER.—To illustrate the contention that, in testing, insufficient consideration has been given to the effect of various conditions upon the resulting values, eleven charts are given, embodying the results of investigations on a number of materials when thickness, temperature, humidity, electrode pressure or rate of voltage application was varied.—*General Electric Review*, November, 1924.

Units, Measurements and Instruments

Measurement of Dielectric Losses at Very High Voltage.—P. CAPDEVILLE and R. LAROCHE.—Among the various methods which have already been suggested to measure dielectric losses at very high voltage, the author investigates, in particular, the use of a very sensitive electrodynamic wattmeter with mirror reading. The main difficulties involved are the extremely high voltage and the large amount of phase displacement, which is usually around 89 deg. The writer analyzes mathematically the various inaccuracies of this method. To arrive at reliable data the results from this method should always be checked with those obtained by another method, such as, for example, one utilizing a large liquid resistor and an air condenser. A check within 5 per cent to 10 per cent should be considered as sufficient for practical purposes.—*Revue Générale de l'Electricité*, Oct. 25, 1924.

Joule's Law of Electric Heating.—W. W. HALDANE GEE.—Excerpts from Joule's notebooks of 1840, preserved in the Manchester College of Technology, show measurements from which he deduced the law bearing his name and incidentally give a clue to the con-

ductivity of the materials he used. His copper wire, for instance, could only have had a conductivity of 42.5 per cent of that now in use.—*Engineer (England)*, Nov. 7, 1924.

High-Voltage Wattmeter.—PHILIP C. CLARK and CHARLES E. MILLER.—This paper contains structural details of the wattmeter and the operating procedure for conducting atmospheric and insulator loss measurements. For diagram of connections see report of Pacific Coast convention of the A. I. E. E. in the ELECTRICAL WORLD for Nov. 1.—*A. I. E. E. Journal*, November, 1924.

Motors and Control

Electrical Applications to Irrigation Pumping.—R. H. CATES.—The author gives information regarding the nature of the pumping load in the irrigated regions of the West, particularly southern California; presents curves showing operating characteristics of the combined units consisting of motor and pump, and describes the Southern California Edison Company's service for testing its consumers' pumping plants. See report of the Pacific Coast convention in the ELECTRICAL WORLD of November 1.—*A. I. E. E. Journal*, November, 1924.

Remote Operation of Valves and Gates.—R. H. ROGERS.—In this illustrated article the author describes installations on the New York State Barge Canal and elsewhere in this country and Europe for push-button or automatic control of canal and dry-dock, penstock valves and gates.—*General Electric Review*, November, 1924.

Heat Applications and Material Handling

Electric Annealing Oven.—W. ROHN.—An electric resistance oven is described in this article for which high efficiency, small maintenance cost and simplicity of operation are claimed. The body of the oven consists of fireproof bricks, arranged in a square or circular shape, completely surrounded by a steel casing fitting air-tight. It is thus possible to fill the oven during the heating operation with an inert gas, such as nitrogen, hydrogen or illuminating gas, or, if it should be preferred, to have the oven operate under vacuum. The heating element itself is suitably embedded between fireproof bricks and is used in the shape of an ordinary steel band such as is used to hold wooden boxes together. As there is no oxygen present in the oven during the heating period, it is possible to use such an inexpensive heating material as iron, instead of the costly chromium nickel alloys which would otherwise be required. Such an oven, designed to heat 4 tons of steel to 800 deg. C., will have a caloric efficiency of from 77 per cent to 71 per cent, depending on the time allotted for the heating period. If this time is four hours, 240 kw. will be required, reaching 77 per cent efficiency. If it is permissible to accomplish this annealing process in eight hours, only 130 kw. will be required, but the efficiency will be only 71 per cent.—*Zeitschrift des Vereines Deutscher Ingenieure*, Oct. 18, 1924.

Electrophysics, Electrochemistry and Batteries

Biologic Action of Electric Waves.—M. G. LAKHOVSKY.—An entirely new field for applied high-frequency radiation has been opened by successful research work of the author, who has found that electric waves of very high frequency affect in an unmistakable way the life of micro-organisms such as microbes. A number of systematic tests have proved the author's theories. Several perfectly healthy plants of the pelargonium species were inoculated with tumor-producing bacteria. After a few days very large tumors developed near the point of inoculation on all plants, as was expected. One-half of the plants were then brought within the electric field of very short wave radiations, a wave length of 2 m. (150,000 kilocycles). After sixteen days of this treatment the tumors began to decay rapidly, and after fifteen more days the tumors were dried and fell off, while the plants not treated succumbed to the disease. The author maintains that this method may ultimately be perfected to act in a similar way on certain bacteriological diseases of the animal and human body. The writer's theory and research work has been upheld and fully acknowledged by the French Société Biologique.—*Radioelectricité*, Oct. 25, 1924.

Studies of Electric Discharges in Gases at Low Pressures.—IRVING LANGMUIR and HAROLD MOTT-SMITH.—This is Part IV of a serial. Previous installments have dealt with the development of methods for finding out what is going on and studying the discharge, particularly in mercury arcs. This one gives a summary of experimental data obtained and analyzes them in considerable detail, leading to conclusions as to the ratio of random to drift current densities, the ratio of electron to positive ion concentrations and the degree of ionization of the mercury vapor.—*General Electric Review*, November, 1924.

Traction

A Mountain Express Engine.—B. VANNES.—The author describes the 15,000-volt, 16⅔-cycle, single-phase locomotives with compensated series motors built by the Austrian Brown-Boveri Company in conjunction with the Lokomotivfabrik Floridsdorf for the Arlberg line electrification. The total weight is 115 tons, of which 87 tons is adhesive weight, and the maximum drawbar pull is about 35,000 lb. A diagram of wheel loads is shown.—*Electrician (England)*, Oct. 10, 1924.

Electrification of Foreign Railways.—S. PARKER SMITH.—In this, the eighth and last of a series of articles published from time to time since July, 1923, the author describes main-line electrifications and projects in countries other than those previously considered; that is, chiefly in America outside of the United States, Asia, South Africa and Australia. The information includes statements as to voltage, length of line, nature of traffic, grades, source of power and size of plant and a considerable amount of locomotive data conveniently tabulated.—*World Power (England)*, November, 1924.

Financial Aspects of Main-Line Electrification.—Sir PHILIP DAWSON.—The author's paper, presented at the first World Power Conference, here abridged, was prepared to show the advantage to the railways and to the public of electrifying British main lines. The data are based on the author's investigations in connection with a report prepared for submission to the Ministry of Transport.—*World Power (England)*, November, 1924.

Single-Phase Locomotives for the New York, New Haven & Hartford Railroad.—The new freight and switching locomotives are briefly described, with diagrams showing the principal dimensions. Power will be taken from the trolley at 11,000 volts, single-phase, stepped down to 2,300 volts, and converted through a synchronous motor-generator set to direct current driving standard series railway motors.—*General Electric Review*, November, 1924.

Telegraphy, Telephony, Radio and Signals

Improvement of the Geophone by the Use of Electrical Sound Amplifiers.—W. T. ACKLEY, JR., and C. M. RALPH.—The geophone has occupied a prominent position as a mine signaling device. The Bureau of Mines has carried out tests at different times with a view to improving the early types of apparatus. This paper describes briefly the adoption of the vacuum-tube audio-frequency amplifier to a new form of geophone.—*Serial No. 2639 of the Bureau of Mines.*

Telephone Development.—E. WILLIAMS.—This article deals with the making of studies for plant planning, describes methods and forms to be used in the preliminary survey and gives suggestions for estimating future growth. To the American reader the statistics and charts will be interesting in themselves. These include comparisons of changes in the value of imports and exports and in the number of telephones in Great Britain and in Denmark from 1910 to 1922 and a table of telephone densities for twenty-seven countries in Europe, ranging from twelve inhabitants per telephone in Denmark to 3,630 in Turkey.—*Electrician (England)*, Oct. 24 and 31, 1924.

Modern Navigation Devices.—F. E. SMITH.—Most of the devices and methods described in this article, which is illustrated, are electrical. They include the leader gear, an insulated cable laid along the bottom on the course to be followed by ships, with the necessary apparatus for picking up the sound produced by an alternating current in it, subaqueous sound ranging and the radio-acoustic method of position finding, echo sounding and directional wireless.—*Engineer (England)*, Nov. 7, 1924.

Sensitive Radio-Frequency Relay.—GEORGE LEWIS.—The paper describes a new electron relay invented and developed by Ruben, capable, it is stated, of controlling currents as great as 5 amp. by means of extremely small operating currents of any available frequency.—*A. I. E. E. Journal*, November, 1924.

News of the Industry

Coolidge on Muscle Shoals

President for Sale or Long Lease of Government Plant—Puts Fertilizer Production First

THE message of President Coolidge to the Congress which met on December 1 for the short session contained the following recommendation regarding the disposal or utilization of the government property at Muscle Shoals:

"The production of nitrogen for plant food in peace and explosives in war is more and more important. It is one of the chief sustaining elements of life. It is estimated that soil exhaustion each year is represented by about 9,000,000 tons and replenishment by 5,400,000 tons. The deficit of 3,550,000 tons is reported to represent the impairment of 118,000,000 acres of farm lands each year.

"To meet these necessities the government has been developing a water-power project at Muscle Shoals to be equipped to produce nitrogen for explosives and fertilizer. It is my opinion that the support of agriculture is the chief problem to consider in connection with this property. It could by no means supply the present needs for nitrogen, but it would help, and its development would encourage bringing other water powers into like use.

"Several offers have been made for the purchase of this property. Probably none of them represents final terms. Much costly experimentation is necessary to produce commercial nitrogen. For that reason it is a field better suited to private enterprise than to government operation. I should favor a sale of this property, or a long-time lease, under rigid guarantees of commercial nitrogen production at reasonable prices for agricultural use. There would be a surplus of power for many years over any possibility of its application to a developing manufacture of nitrogen. It may be found advantageous to dispose of the right to surplus power separately with such reservations as will allow its gradual withdrawal and application to nitrogen manufacture. A sub-committee of the committee on agriculture should investigate this field and negotiate with prospective purchasers. If no advantageous offer be made, the development should continue and the plant should be dedicated primarily to the production of materials for the fertilization of the soil."

Underwood to Introduce New Muscle Shoals Bill

A new bill dealing with Muscle Shoals has been sponsored by Senator Underwood of Alabama, and efforts are being made to get President Coolidge to approve it. The President referred the bill to the War Department for a report from experts. Its main provisions are:

That the government plants be used for the production of fertilizers and other useful products in time of peace and of explosives in time of war, at least 10,000 tons of nitrogen to be produced the first year as a condition of any lease, 20,000 tons the second, 30,000 tons the third, and thereafter 40,000 tons annually, profit on sales not to exceed 8 per cent.

That the Secretary of War be authorized to lease the plants for a period not to exceed fifty years at an annual rental not less than 4 per cent on the cost of Dam No. 2 and the hydro-electric works and machinery in connection with it, the lease to prescribe the terms under which the lessee may sell surplus power.

That if the Secretary of War is unable to make a lease before July 1, 1925, then the government shall operate the properties through a corporation to be known as the Muscle Shoals Corporation, controlled by a board of five directors appointed and removable by the President, of which the Secretary of War shall be chairman; the powers of this board and the method by which it shall function are described at length.

That the Secretary of War shall complete Dam No. 3, with such modifications as he may deem advisable in the interests of power and navigation, this dam to be leased or operated in conjunction with Dam No. 2.

An entirely new offer for Muscle Shoals has been fathered by former Senator Sutherland of West Virginia, who proposes to organize a fifty-million-dollar corporation to lease the property at a yearly rental of 4 per cent of the government's investment up to May 31, 1922. The corporation would operate under government supervision and produce fertilizer and chemicals and distribute power.

Consideration of Muscle Shoals Deferred

President of Senate Apparently Against a Simple Recommitment to Committee—Underwood Bill Gets Farm Bureau Support but Is Unlikely to Prevail

WHEN the Senate, in conformity with its agreement at the last session, took up the Muscle Shoals bill on December 3 consideration of it was deferred by unanimous consent. In the discussion of this proposal the President of the Senate raised the question as to whether or not, under the terms of the agreement, the measure could be displaced by other business. The discussion revealed that it was the consensus of opinion that the measure could be displaced by unanimous consent, yet the emphasis placed by the chair on the requirement for final disposition leads to the belief that he would not countenance the simple recommitment of the matter to the agricultural committee. Apparently the agreement requires that the Senate legislate on the matter. Before that is done it is certain that considerable discussion will ensue, with the probabilities indicating that the administration in the meantime will adopt a more concrete policy than that outlined in the President's message, as printed on this page.

It is very apparent that the bill proposed by Senator Underwood as a substitute for the measure now before the Senate is not acceptable to a large proportion of its membership. There is no reason to believe the Senate will approve of either government ownership or the subsidizing of fertilizer manufacture. One of the flaws in the Underwood bill is that no provision is made for the surplus power after the needs for fertilizer manufacture have been met. There will be strong opposition to any plan which might result in placing the surplus power at the disposal of a fertilizer manufacturer who might utilize it on the ground to make aluminum, manufacture chemicals or something else and prevent its distribution. There is very strong sentiment in the Senate to the effect that any surplus not required for fertilizer purposes should go for public utility use.

Senator Underwood states that sight frequently is lost of the fact that the government undertook the Muscle Shoals project for the purpose of fixing nitrogen for use in explosives in time of war and for use in fertilizers in time of peace. Since this is the main purpose of the development, he refuses to consider any other use of the properties until provision has been made for the manufacture of nitrogen in substantial quantities. His bill has the backing of the American Farm Bureau Federation, which wields no small amount of political power, and the proponents of the Ford offer generally. In a formal statement the Farm Bureau Federation declares the Underwood bill "makes for action." "It contains the fertilizer provision of the Ford offer," continues the statement, "and, of course, that is one of the main contentions of the farmers. It does not shunt the bill to another investigating committee — congressional or otherwise — and keeps the fight in the open. It also assures the public that the power bill will not be turned over to a power commany to distribute."

The Muscle Shoals electrical power and nitrate plants will be ready to operate by July 1 next year, should Congress so desire, Major-General Taylor, chief army engineer says in his report: The budget estimate is that $6,541,590 will be needed to complete Dam No. 2.

Merger of Great Western and San Joaquin Accomplished

H. P. Wilson, president of the Western Power Corporation of New York, announced on Tuesday of this week that that company had entered into an agreement to acquire control of the San Joaquin Light & Power Corporation through the purchase of shares of its preferred and common stock, the ownership of the prior preferred stock, which is widely distributed, not being affected. This will make the merger of the Great Western Power Company of San Francisco and the San Joaquin Light & Power Corporation, foreshadowed in the ELECTRICAL WORLD last week, an accomplished fact. Control of two affiliated corporations, the Midland Counties Public Service Corporation and the Fresno City Water Corporation, is included in the arrangement. A special meeting of the stockholders of the Western Power Corporation is soon to be called in connection with the matter.

The operating companies involved will continue under present policies and methods of operation. No president of the Great Western Power Company will be immediately elected to succeed Mortimer Fleishhacker, who, as stated last week, has been forced to resign because of ill health. J. B. Black, vice-president and general manager, will be in executive charge of this company. A. Emory Wishon remains as general manager of the San Joaquin.

President Low of A. S. M. E. Is for Regulation of Coal

Addressing the forty-fifth annual meeting of the American Society of Mechanical Engineers, held in New York this week, Fred R. Low, the retiring president, citing the complete dependence of the existing American civilization on power and its utilization, and proving that chief dependence for power would be on steam produced from coal even were all the country's water power developed, warned against monopolistic control of coal resources as inimical to the public interest.

"Power is of such vital and increasing importance," he said, "that its control would give its possessor a mastery over his fellows and opportunities for tyranny and extortion possessed by no autocrat of any previous empire, visible or invisible, feudal or industrial. The people may well be concerned over any gesture in that direction. Happily, their interest in the water powers has been guarded by the federal water-power act of 1920, which, maintained in its integrity and faithfully administered, will retain the title of the nation in these resources, under conditions that offer opportunity to initiative, security to capital and freedom from extortion to the consumer. Control over the distribution and sale of power by public utility corporations is in the hands of public service commissions in most of the states. But an uninterrupted and abundant supply of power cannot be assured to the nation at reasonable rates so long as the fuel from which most of it is made is subject to the uncontrolled manipulation of private interest and the organized will—or won't—of labor."

President Low also discussed many of the problems of obtaining increased efficiency in the production of power and gave a comprehensive analysis of reasons why it is to be hoped the power industry, aided by the chemist and physicist, may some day obtain more of the energy stored in fuels than can now be done merely by the process of burning them.

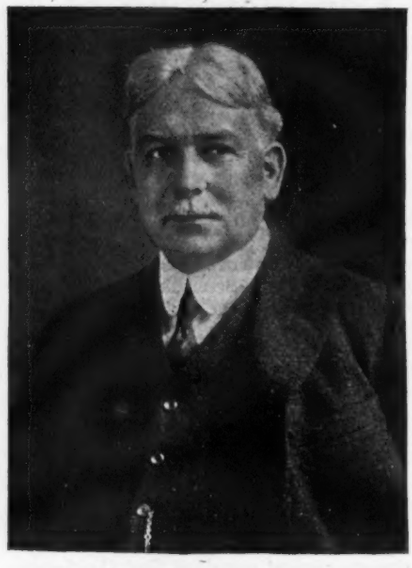
A series of papers on fuel-oil handling and burning and other papers on pulverized fuel evoked discussion of no little value. These and other features of the technical program of the convention will be reported in an early issue of the ELECTRICAL WORLD, together with an exposition of the developments of the year as reflected by the Power Show held concurrently with the convention.

The annual dinner was made an opportunity for the promotion of acquaintanceship among the members and for listening to brief talks by the past and present officers of the society. Dr. Livingston Ferrand spoke on the improvement of health and mentality.

Death of John L. Harper

Vice-President and Chief Engineer of Niagara Falls Power Company Had Been Potent Instrument in the Extraordinary Development of Power from the Falls

THE death at Niagara Falls, N. Y., early Friday morning, November 28, of John L. Harper, vice-president and chief engineer of the Niagara Falls Power Company, removes an outstanding hydro-electric engineer who for twenty-two years had been associated with power development at the Falls. Mr. Harper's death followed an operation for appendicitis performed on the Monday previous. He was only fifty-one years of age.



JOHN L. HARPER

John Lyell Harper was born at Harpersfield, Delaware County, N. Y., in 1873, passed his youth between hard work on his father's farm and the determined pursuit of education, went to Stamford Seminary, near his home, and was finally graduated from Cornell University in 1897. After his graduation he went to the Pacific Coast and spent a year at Seattle with the Union Electric Company. Thence he removed to Minneapolis, where he was associated for three years with the Twin City Rapid Transit Company and the St. Croix Power Company, giving his special attention to design and operation. In 1902 he joined the old Hydraulic Power & Manufacturing Company at Niagara Falls and two years later was made its chief engineer. At Niagara he found a fitting field for his abilities, and when a merger of all the power companies on the American side of the river was brought about in war time, through the agency of the national government, Mr. Harper became vice-president as well as chief engineer and responsibility for the development of the consolidated company fell chiefly into his hands.

Mr. Harper constantly studied ways to preserve the beauty of the cataract. As early as 1910 he grasped the possibilities of distributing the flow of the river over the entire crest of both the American and the Horseshoe Falls so that more water could be diverted for power purposes without marring the scenic effect, and he was still working on this plan, which would prevent uneven erosion of the riverbed under the Falls, where death overtook him.

In addition to his engineering responsibilities, Mr. Harper was intimately connected with the application of electricity to electrochemical and electrometallurgical industries. He made scientific investigations of various processes in the Niagara Falls territory with the view of determining their desirability as central-station load, and he developed and patented several electric furnaces. He attracted many industries to Niagara Falls, providing ample power at equitable contract rates.

In March of this year Mr. Harper became senior partner of Harper & Taylor, Inc., a firm formed to engage in the general practice of engineering, especially the investigation of water power and the design, construction, operation and management of hydro-electric plants. This firm has offices in Philadelphia and Niagara Falls, H. Birchard Taylor of the former city being the other member. Mr. Harper was also chief engineer of the Canadian Niagara Power Company and the Niagara Junction Railway Company. He was a member of the American Institute of Electrical Engineers, the American Society of Civil Engineers, the American Society of Mechanical Engineers, the American Electrochemical Society and the American Ceramic Society. He took an active part in technical society affairs and was in wide demand as a lecturer on Niagara Falls power development. His home was at Lewiston, N. Y., on the Niagara River. He leaves a widow and five children.

Northern Ontario Merger

Northern Canada, Hollinger, Great Northern and Abitibi Will Probably Consolidate

ALTHOUGH some of the important details are still lacking, there is sufficient information to hand to show that a rearrangement of the entire hydro-electric power situation in northern Ontario is about to take place. Present negotiations are expected to result in a consolidation of the Northern Canada Power, Ltd., the Hollinger Consolidated, the Great Northern Power and the Abitibi Power & Paper Company.

Announcement has just been made that an agreement has been reached between the Northern Canada Power, Ltd., and the Nesbitt-Thomson Company of Montreal, representing the other parties to the amalgamation, for the sale of the Northern Canada Power Company's plants. It is understood that the Hollinger power plant at Island Falls will be taken over and utilized by the Abitibi company, which now stands in need of an additional supply, considering both its present requirements and the program of expansion upon which the company is entering.

The situation with regard to Northern Canada Power, Ltd., is that the majority of the shareholders have agreed to sell control at $40 a share for the common stock, provided that the purchasers pay into the treasury of Northern Canada Power a sum sufficient to take care of the company's current liabilities before the completion of the sale. The purchasers also agree to take all further common shares of Northern Canada Power at the same price, provided delivery is made by December 31. Actually the deal is not yet completed, but there seems very little doubt that it will be closed on the basis of the present agreement.

This transaction automatically settles a long-standing power dispute between Northern Canada Power and Hollinger, the latter company having sued the former on the grounds of non-fulfillment of a contract to supply power.

It is quite possible that a general reduction in power rates throughout the Temiskaming mining country will follow. A cut of as much as 20 per cent has been mentioned. One important feature of the arrangement is that it will pave the way for Hollinger to increase its production to the 8,000-ton mark, according to the plans formulated by the management.

Difference of View on Next Step in Skagit Project

As a preliminary step in the continued development of the Skagit River by the city of Seattle, an application has, as previously reported, been filed with the Federal Power Commission by that city for permission to dam the river just below the mouth of Ruby Creek. The dam, which would be 480 ft. high and 1,000 ft. long, would create a large storage reservoir and develop approximately 300,000 hp. It is planned to carry the water 3¼ miles through a 28-ft. pressure tunnel to the power house just above the mouth of Stetattle Creek. The site of this development is from 7 to 10 miles above the present Gorge Creek power house on the Skagit River.

There is a diversity of opinion among the city officials as to the next step in the Skagit development. It is understood that one group of officials, including Mayor Brown and C. F. Uhden, Skagit engineer, favors the immediate construction of the Gorge dam. This would raise the head at the present power house about 100 ft. and permit of running the present installed units at their full capacity during such time of the year as there is sufficient water in the river. Another group favors the construction of the Ruby development, to increase materially the hydro-electric output of the municipal system, as well as to regulate the flow of the river, by means of the storage created, so as to deliver to the turbines in the Gorge plant an even flow of water the year round.

Mayor Brown has appointed J. D. Blackwell, city engineer; J. D. Ross, superintendent of the city light department, and Mr. Uhden to prepare a complete report covering all angles of both developments.

Experimental Fish Escalator in Columbia River

ABOVE is shown an experimental fish escalator installed at the 125-ft. Condit Dam in the Columbia River, Washington State, under the direction of Prof. John N. Cobb. By this system salmon on their way to the spawning grounds have been taken to the top of the dam in a single-basket conveyor and dumped on the other side without injury. Next spring further experiments will be conducted on the same site with trout, as well as experiments in getting the young fish down over the dam. The Condit Dam belongs to the Northwestern Electric Company of Portland, Ore.

Canadian Bodies Disagree on St. Lawrence Project

Resolutions asking the Dominion government to approve the application of the Hydro-Electric Power Commission of Ontario for permission to develop the Morrisburg section of the St. Lawrence River power project, and condemning the methods proposed by the Deep Waterways and Power Association for meeting the cost of the deepening of the river by charging it to the users of power, were adopted by the executive committee of the Hydro-Electric Municipal Association at a meeting held in Toronto on November 26.

At the convention of the Canadian Deep Waterways and Power Association, held at St. Catharines, Ontario, two days later, a resolution was adopted urging upon the Dominion government the advisability of proceeding with the deepening of the river. Secretary A. C. Lewis declared that a shortage of power in eastern Ontario made the St. Lawrence development urgent. President O. E. Fleming referred to the apparent conflict between the association and the Hydro-Electric commission and deprecated any dispute. He suggested that the Canadian and United States governments organize an international body, composed of an equal number of representatives, and that the two countries pass similar legislation to carry through the development. Bonds could be issued as a first charge against the project and these could be guaranteed by the two governments. The governments of Canada and the United States could, Mr. Fleming said, build the whole canal and power system at a cost which would not equal the cost of the power development alone if done by the Hydro-Electric commission.

Sir Adam Beck May Retire

Sir Adam Beck, chairman of the Ontario Hydro-Electric Power Commission, addressing a meeting at London, Ontario, asserted that he was giving serious consideration to retiring from public life. "You will recall," he said, "a statement made in Toronto the other day that I was considering retiring from public life. It was not taken seriously, but I want to say here today that I am serious, absolutely sincere."

Projects Before the Federal Power Commission

The Denver Power & Irrigation Company has applied to the Federal Power Commission for a license for an installation on the South Fork of the South Platte River, in Douglas and Jefferson Counties, Col., covering a pressure power conduit extending from a proposed water-supply reservoir of the city of Denver one mile south of the river to a proposed power house to be built about 6 miles downstream. The power will be for general sale. The capacity has not been determined. (In this connection see the account of a municipal project printed in the ELECTRICAL WORLD for November 1, page 966.)

The Hillside Water Company has ap-

plied to the Federal Power Commission for a license covering the project on the North and Middle Forks of Bishop Creek near Bishop, in Inyo County, Cal. It is the aim to use for power purposes the water in four reservoirs intended primarily for irrigation. Generation would take place at existing plants of the Nevada-California Power Company and the Southern Sierras Power Company.

The Alaska Public Utilities Company has applied for a license covering an existing plant on Humpback Creek, which is supplying electricity to the town of Cordova. The Washington Power Company has applied for a license covering a transmission line in Shoshone County, Idaho. The Gold Coin Mining Company has applied for a license authorizing the construction of a transmission line in Granite County, Mont. The Montana Power Company has asked for a license covering 27 miles of transmission line in Stillwater County, Mont.

Georgia Electrical Association Discusses Commercial Topics

The semi-annual meeting of the Georgia Electrical Association was held at the East Lake Country Club, Atlanta, on Wednesday, November 26, with an approximate attendance of 100. J. E. Mellett of the J. M. Clayton Company, president of the association, was in charge of the meeting. The morning was given over to the business session and the afternoon to a golf tournament.

The principal speaker was H. T. Melhuish, assistant manager of sales of the Radio Corporation of America. Mr. Melhuish stated that he anticipated that the present extraordinary demand for radio equipment would continue for at least two and a half to three years longer, basing his opinion upon the fact that out of the twenty-six million homes in America only four million possessed radio sets, and furthermore on the fact that the new equipment has made obsolete a large percentage of that sold in the past. He also stated that superpower broadcasting stations, which will probably be installed throughout the country by manufacturing companies, will further enhance sales possibilities. Mr. Melhuish said that the guarantee of prices to April 1 will stabilize the market and remove the sales resistance that would result from the fear of a break in prices. No one, the speaker said, has as yet devised any sales organization or merchandise plan that adequately meets the needs of farmers, and as the farmers of America offer a great potential market for the sale of radio equipment, he recommended that the association and its individual members give consideration to means of reaching this rural population.

Charles A. Collier, general sales manager of the Georgia Railway & Power Company and regional director of the better home-lighting campaign for the Southeastern division, gave an outline of the activities in his division, stating that more than 220 communities in the six states had conducted contests. These had aroused an immense amount of interest in home lighting, which was already reflected in a larger jobber's lighting fixture and lamp business. Mr. Collier remarked, however, that the industry must not expect to be able to measure the results of the contest with a yardstick and anticipate immediate returns in full. The activity was primarily educational, and the results would be to a large extent intangible.

R. H. Scott, advertising manager of the Carter Electric Company, Atlanta, talked on the "Red Seal" plan which will soon be ready for operation by the Society for Electrical Development. He thought the plan could be used for the improvement of wiring in Georgia.

Attorney-General Files Brief in Chicago Canal Case

On Wednesday of last week Attorney-General Stone filed in the United States Supreme Court his brief setting forth the government's insistence that the Chicago Sanitary District be restricted to the withdrawal of 4,167 cu.ft. of water a second from Lake Michigan. This case, as readers of the ELECTRICAL WORLD are, of course, aware, has an important bearing on the projected power development of the St. Lawrence. All states on the Great Lakes, with the exception of Illinois, have joined the federal government in the contention that the present withdrawal of approximately 10,000 ft. of water a second is impairing navigation on the lakes and connecting waterways. The practice also has brought protests from Canada. Missouri, Tennessee, Louisiana and commercial organizations in the Missisippi Valley, on the other hand, have joined the Sanitary District in representing that the present withdrawal is essential for sanitary purposes and for maintaining navigation on the Mississippi River.

Argument was expected to be reached on this case by Friday of this week.

Pictures Sent by Radio Over the Atlantic

Transmission of photographs over the Atlantic by wireless telegraphy became an established fact on Sunday last when the Radio Corporation of America received from London more than a dozen more or less easily recognizable photographs of well-known men. The first picture to be sent was a photograph of President Coolidge, 3½ in. by 5 in. The transmitting apparatus in London translated the picture into radio impulses. A receiving mechanism in the central radio office of the Radio Corporation of America in New York translated the signals simultaneously into two different pictures—one a pen-and-ink sketch of the President and the other a special photographic representation of him. Pictures of the other public men followed in quick succession.

The radio signals were made to sketch the picture by means of a fountain pen on a revolving cylinder of paper and at the same time to control a light beam which traveled over a film and rephotographed it. The sending and receiving were, of course, simultaneous, but the time consumed in projecting the whole picture across the Atlantic was approximately twenty minutes from start to finish.

General J. G. Harbord, president of the Radio Corporation of America, said that he regarded the development as the most important which has taken place during the time that he has been connected with radio—surpassing the achievement of simultaneous broadcasting from many stations. He predicted that it would be of importance not only in sending pictures but in sending commercial messages and in transferring signatures and fac similes of documents on short notice over great distances.

A. I. E. E. Plans Its Midwinter Program

New York Convention Will Be Held on February 9-12—Spring Meeting Goes to St. Louis and June Gathering Will Take Place at Saratoga

MACHINE design will as usual be a prominent feature of the program of the midwinter convention of the American Institute of Electrical Engineers, which will be held in New York City on February 9 to February 12. Of equal importance, however, will be the sessions on transmission, electrophysics, electrical measurements and communication. Electrochemistry and statistics will be represented by at least one paper each. A smoker, an evening devoted to a special meeting, a dinner-dance and inspection trips will constitute the social and non-technical events in the program.

The technical program is still in a tentative stage, but it is expected to include the following papers among many others: "The Thermal Time Constants of Electrical Machines," by A. E. Kennelly, Harvard University; "Squirrel-Cage Induction-Motor Core Losses," by Thomas Spooner, Westinghouse Electric & Manufacturing Company; "Factors Affecting the Design of Direct-Current Locomotives," by R. E. Ferris, Westinghouse Electric & Manufacturing Company; "Studies of Transmission Stability," by R. D. Evans and C. F. Wagner, Westinghouse Electric & Manufacturing Company; "Study of Direct-Current Corona in Various Gases," by F. W. Lee and B. Kurrelmeyer, Johns Hopkins University; "Stresses in Bus Supports During Short Circuit," by O. R. Schurig and M. F. Sayre, General Electric Company; "Testing Impregnated-Paper-Insulated, Lead-Covered Cables," by Everett S. Lee, General Electric Company, and "Voice-Frequency Cable-Carrier Telegraph System," by H. Nyquist and B. P. Hamilton, American Telephone & Telegraph Company, and W. A. Phelps and M. B. Long, Western Electric Company.

SPRING AND SUMMER MEETINGS

It has been determined to hold the spring meeting of the Institute at St. Louis on April 13-17 and the June convention at Saratoga Springs, N. Y., in the last week in June.

Code Is Cross-Indexed

Association of Electragists Issues a Ninety-six-Page Volume to Fill Real Need

THERE has just been compiled by Robert A. Goeller for publication by the Association of Electragists International a complete "Cross-Index and Guide to the 1923 National Electrical Code," designed to make the code an "open book" to the electrical industry. Last year the electrical committee of the National Fire Protection Association completely recodified the code. This was a long-needed improvement and made it much easier to use, but even then it was found that much time was lost by contractors' foremen and wiremen looking through the code for rules on some particular type of construction. Many times work has been done in accordance with one rule only to find out later that there was another rule that applied to that particular type of work.

The code has an index, but it merely lists references according to code headings and is thus an insufficient guide to one who does not know what rule he is looking for. Many subjects have more than one reference in the code, and many a contractor has found to his sorrow, the association says, that it is necessary to have all the references if he is to work entirely in conformity with the code. Mistakes made because of overlooked or unknown rules in the code are expensive to the contractor, whether he makes them himself or his wiremen make them.

The cross-index compiled by Mr. Goeller, who is second vice-president of Hatzel & Buehler, Inc., is ninety-six pages long and contains more than four thousand references. It covers every rule in the code under every conceivable heading. Furthermore, each heading in the cross-index gives every reference that is contained in the code on that particular subject. There is thus available in this volume a complete code reference on every possible point. This cross-reference plan has been tested by Mr. Goeller and his staff for six or eight months in their own work, and with it, the association declares, the electrical contractor for the first time may take full advantage of the code. The book is approximately code size and is made in a sturdy yet flexible form to fit the pocket and when needed at the desk to lie open at any desired page. A foreword by J. C. Hatzel, president of Hatzel & Buehler, and one of the country's pioneer electrical contractors, points out the handicap under which the contractor has labored because such a cross-index has not before been available.

Secretary Work Urges Bureau of Public Works

In his annual report to Congress Secretary of the Interior Work urges the establishment in his department of a Bureau of Public Works. In support of this recommendation he says:

"Government responsibilities in construction, now scattered through the different federal departments, have reached such magnitude that they need to be organized and co-ordinated. This should be accomplished by bringing them together under a single control through the creation of a Bureau of Public Works, constituted under the Department of the Interior. The establishment of such a bureau would create a co-ordinated governmental industrial organization, efficient and economical in times of peace, ready in time of war or emergency to bring instantly into action the whole unified engineering and public works functions of the government.

"It would render even more efficient the present budget system, with standardized and simplified specifications and contract forms, co-ordinated estimates and unified control of governmental construction activities. It would enable the governmental service to attract and hold the highest type of technically trained men by offering more permanent and attractive work and ample scope for the exercise of technical and administrative ability. The personnel for such a technical bureau could readily be assembled from the different departments of government to create this essential instrument of administration."

Rural Service in the South

Extensive Experiments Are Being Carried to Success in Alabama with Co-operation of Alabama Power Company—Virginia Railway & Power Ready to Begin

EARLY results of the co-operative agreement entered into at the first of this year between the agricultural experiment station of the Alabama Polytechnic Institute at Auburn, Ala., and the Alabama Power Company to undertake a comprehensive investigation regarding the possibilities of electrifying the farms of that state are reported in the November *C. R. E. A. Bulletin*, published by the National Committee on the Relation of Electricity to Agriculture. The Virginia branch of this committee consists of E. A. O'Neal, R. F. Groom and T. J. Whatley. Under the agreement referred to it is proposed to install one or more experimental lines in each of the important agricultural regions of the state.

There are now 29.6 miles of rural distribution completed by the company, and 38 miles more have been authorized for early construction. Of this, 12.1 miles is in Madison County, where twenty-four general farms and one poultry farm are served, six water-supply systems, five ranges, one rock crusher and one cotton gin being among the installations. On the Five Points line, in Chambers County, there are 3½ miles of 2,300-volt single-phase and three-phase line, with sixty-six customers, most of whom are small farmers raising cotton almost exclusively. Energy is being used for lighting, water pumping, cooking, wood saws, farm shops, gristmills and ginning. Complete records are being made of installations and operating cost, with measurement of returns to farmers.

The Gardendale line, in a dairy and trucking section in Jefferson County, is serving sixty-seven customers from 4 miles of 2,300-volt single-phase line. These customers expended an average of $42 each for wiring, fixtures and equipment. There are on the line two ranges, five water-supply systems and one milking machine, in addition to small household appliances. The work on the other lines is being developed as rapidly as possible, it being impossible to keep up with the farmer's demand. Manufacturing companies are co-operating.

Rates and Poles

The Alabama Power Company is now giving attention to the development of a rate for agricultural service. It is felt that the final solution of this problem must await results of the investigation which is under way. Present farm customers are being served on the following standard town rates: Lighting, 9 cents net per kilowatt-hour, $1 per month minimum; power, $1.50 per month per kilowatt demand and 3 cents net per kilowatt-hour for energy. If the customer installs an electric range, he is served at a combined lighting and cooking rate.

All rural lines are constructed in accordance with the standard rural specifications of the Alabama Power Company, using creosoted pine poles, painted wood cross-arms and medium-hard-drawn bare copper wire for both primaries and secondaries. All poles are class B, with a minimum of 35 ft. length and spaced 275 ft. apart. Standard six-pin cross-arms are used on all main-line work. The minimum size wire used is No. 6 for both primaries and secondaries, except that No. 8 may be used for services.

Progress in Virginia

More than thirty farmers in the Fairfield district of Henrico County, Va., have signed an agreement with the Virginia Railway & Power Company and pledged sufficient funds for the construction of a transmission line to supply them with electrical energy. This will be the first rural experimental line in Virginia. A number of the farms will be selected for intensive studies. They will be equipped with all modern electrical conveniences for the home. Electrical equipment for farm labor will be supplied, such as apparatus for grinding feeds, sawing wood, pumping water, milking, cutting ensilage and all other work for which electric equipment is available. Complete records will be kept of the costs as compared with other available power.

These studies will be conducted by the department of agricultural engineering of the Virginia Polytechnic Institute, with J. A. Waller, Jr., in charge of the actual field studies. The Virginia committee on the relation of electricity to agriculture will have general supervision over this work and act as an advisory and co-ordinating body. Charles E. Seitz, head of the department of agricultural engineering at the

Virginia Polytechnic Institute, is chairman of the committee, and the membership is composed of representatives of the principal electric power companies and agricultural organizations of Virginia.

W. L. Kirby, agricultural director of the Richmond Chamber of Commerce, is responsible for the organization of the farmers and location of this important project in Henrico County. The Virginia Railway & Power Company is making the project possible by its whole-hearted co-operation.

Progress of Portland (Me.) Central-Station Company

Healthy expansion of plant is in progress on the system of the Cumberland County Power & Light Company, Portland, Me., and estimates are now being prepared for the 1925 budget of engineering work. The company is at the present time placing in operation a 12,500-kw. steam turbine at its new oil-burning station on the Portland waterfront, increasing the capacity of this installation to 22,500 kw.

A new steel-tower transmission line designed to operate at 66,000 volts but at present used at 38,000 volts has been built from the company's hydro-electric stations in the Saco Valley to Saco, further developing the loop transmission system in the Portland district, and a 6,000-kw. interconnection is now in service between the Cumberland County and Central Maine Power Company systems. The engineering department is studying the cost of betterment work at the North Gorham hydro-electric station, including the prospective installation of more efficient waterwheels and adoption of various features of automatic operation.

The commercial activities of the company have been stimulated by its removal early this year into a new office building fronting on Monument Square, where a ground-floor corner location is utilized by the appliance department. Until the business recession struck Portland merchandise sales gained about 60 per cent per month in the new location, and this business is now showing signs of recovery. Energy sales of the company dropped off somewhat during the summer in comparison with last year, but the outlook is improved. Quiet but steady progress is being made in the gradual elimination of direct-current service in the city of Portland. The company has ceased to supply new service of this kind and is replacing old direct-current installations with alternating current on the basis of bearing the remaining undepreciated cost of the old equipment replaced, the owner paying for the new apparatus required. This company is one of a very few that have capitalized a power-factor penalty clause in power contracts, and about 600 hp. in synchronous apparatus has lately been installed in various industrial and heavy-power-using establishments for power-factor betterment, the customer with subnormal power factor meeting this cost through the rate agreement.

Briefer News

Shawinigan Will Plant Trees. — Recognition of the important part that forests play in the control of water on streams where there are power developments has been given by the Shawinigan Water & Power Company. The company has decided to begin next year the planting of trees on the banks of the St. Maurice River in the Province of Quebec.

Gas Street Lamps Displaced in San Francisco.—The lighting committee of the Board of Supervisors of San Francisco has ordered the replacing of gas street lamps with electroliers in the area bounded by Market, Twenty-fifth, Mission and Guerrero Streets. The Pacific Gas & Electric Company was requested by the committee to make an estimate of the cost of installing the new electric system.

Alaskans Get Reduction in Electric Rates.—The Alaska Light & Power Company, which serves Juneau, Douglas and other communities on the Gastineau Channel, has put into effect the rates established by city ordinance passed in Juneau more than two years ago and which the company had fought in the courts. Its action follows the refusal of the United States Supreme Court to grant the company a writ of error by which it might carry the suit to that court.

Shreveport, La., to Have New Power Station.—The Southwestern Gas & Electric Company is about to start work on a new steam power station at Shreveport, La., to supplement the existing plant. The new station will have an initial rating of 10,000 kw. and an ultimate capacity of 50,000 kw. That part of the plant to be completed within the next year will cost approximately $1,250,000, and it is anticipated that the total investment in the new plant at the end of ten years will have reached $2,500,000 or $3,000,000.

Guthrie (Okla.) Citizens Renew Electric Light Franchise.—An election held in Guthrie, Okla., last month on the question of renewing the franchise of the Public Service Company of Oklahoma, which furnishes electric light and power in that city, resulted in favor of the company by a vote of nearly eight to one. Guthrie has a population of 12,000.

Valmont Plant Goes Into Service.—The first unit of the Valmont or Lakeside steam plant of the Public Service Company of Colorado has gone into service. This plant, it will be remembered, is supplied with water from a great artificial reservoir known as Boulder Lake, high in the mountains, 4 miles east of Boulder. The initial installation is rated at 20,000 kw. and cost about $4,000,000. Ultimately the plant is to have a capacity of 120,000 kw. and will cost approximately $12,000,000.

Wisconsin Farmer Did Not Get $600 for Interference with Radio.—An item published in these columns on November 22 to the effect that a condemnation commission in Wisconsin had awarded $600 damages to a farmer because of anticipated interference with his radio receiving set by a transmission line of the Milwaukee Electric Railway & Light Company which was to be strung across his farm turns out to have been based on a correspondent's misapprehension of the decision. The $600 granted to the farmer was for a right-of-way, and no extra allowance was made because of interference with radio.

Low Rates at St. John, N. B.—The New Brunswick Power Company, which serves the city of St. John in New Brunswick, Canada, has reduced its rates for the second time this year. For domestic service the energy rate has been cut from 3½ cents per kilowatt-hour to 2¼ cents, and the monthly service charge has been reduced from 80 cents to 54 cents. St. John receives also hydro-electric energy from the Musquash development of the New Brunswick Power Commission.

Indianapolis Rates Still Under Consideration. — Representatives of the Merchants' Heat & Light Company of Indianapolis conferred recently with the Public Service Commission in regard to a proposed readjustment of electric rate schedules in Indianapolis. The commission conferred also with representatives of the Indianapolis Light & Heat Company, but on a different day. The commission accountants have prepared tentative schedules of rates for the two companies, which now are under consideration. No agreement, however, was reached at the conferences.

Grand Junction (Col.) Utility Company Gives Banquet.—A noonday banquet was given by the Grand Junction (Col.) Electric, Gas & Manufacturing Company recently to two hundred mem-

Coming Meetings of Electrical and Allied Societies

[A complete directory of electrical associations is published in the first issue of each volume. See July 5 issue, page 50, for latest list.]

West Virginia-Kentucky Association of Mine, Mechanical and Electrical Engineers — Frederick Hotel, Huntington, W. Va., Dec. 12-13. Herbert Smith, Room 211 Robson-Prichard Bldg., Huntington.

Kentucky Association of Public Utilities—Louisville, Jan. 15-16. E. F. Kelley, Louisville Railway Co., Louisville.

Electrical Safety Conference — New York, Jan. 21. R. B. Shepard, 109 Leonard St., New York.

Western Association of Electrical Inspectors — Brown Hotel, Louisville, Ky., Jan. 27-29. G. M. Miller, 1304 South Seventh St., Louisville.

Wisconsin State Association of Electrical Contractors and Dealers—Pfister Hotel, Milwaukee, Jan. 28-30. H. M. Northrup, 23 Erie St., Milwaukee.

Wisconsin Chapter of Electrical Inspectors—Pfister Hotel, Milwaukee, Feb. 17-19. A. C. Schultz, Milwaukee.

bers of local business clubs and other invited guests. The banquet was held in the generating room of the company's power plant, and the guests were taken on an inspection trip and witnessed an electrical demonstration made by H. T. Plumb, engineer with the General Electric Company at Salt Lake City and a vice-president of the A. I. E. E. A. E. Anderson, general superintendent of the Grand Junction company, acted as host.

Calumet Company to Supply Gary Tube Works.—The Calumet Gas & Electric Company, an Insull property serving sixty-two communities in northern Indiana, with headquarters in Gary, has signed a contract with the Gary Tube Company, a subsidiary of the United States Steel Corporation, for furnishing electrical energy for the operation of its new tube works. Power will be supplied from the substation of the Calumet company at Aetna. This substation, which is nearing completion, is connected by a 132,000-volt line with the Calumet generating station of the Commonwealth Edison Company in South Chicago and the generating station of the Public Service Company of Northern Illinois at Joliet

Grenoble, France, to Have Water-Power Exhibit Next Year.—A main feature of an exhibition which is being organized under the direct patronage of the French government and will be held at Grenoble from May to October next year, according to advices received by the Bankers' Trust Company of New York from its French information service, will be a water-power section to include a large power house covering 4,184 sq.yd. This will contain exhibits covering all the modern methods and devices for harnessing water power derived from rivers and waterfalls. There will be a building devoted to the application of electricity in industry and a modern dwelling house containing every possible application of electricity for domestic purposes.

Automatic Substation Progress in Great Britain.—Although automatic operation of substations is a relatively recent development in Great Britain, it is now making noteworthy progress and is receiving rapidly increasing attention. As an indication of this it may be stated that the British Thomson-Houston Company, Ltd., of Rugby has manufactured or has on order forty-one automatic substation equipments totaling nearly 72,000 kw. for use in the United Kingdom and overseas. The machines are either rotary converters or synchronous motor-generator sets, according to the conditions to be fulfilled, and operate on frequencies of from 25 cycles to 50 cycles and at 400 volts to 3,000 volts direct current.

How Street-Lighting Costs in Detroit Have Come Down.—In a brief history of street lighting in Detroit recently given by Frank Mistersky, superintendent of the municipal plant, it was asserted that the cost is steadily going down. "The cost per arc lamp for the year ended June 30, 1923, was $62.38," said Mr. Mistersky. "For the year ended June 30, 1924, the cost was about 10 per cent lower than that, and for the current fiscal year ending in June, 1925, it will be still lower. The lower cost is the result of a reduction in the cost of fuel, increased efficiency in the manufacture and distribution of power and a decreasing cost of electrical apparatus necessary for lighting streets." The municipal lighting plant was completed in 1896 under the direction of Alex Dow, who was at that time city electrician.

Making Election Results Plain by Electricity.—No one in Cincinnati or across the river in Kentucky had to remember a prearranged plan of signals in order to know how the presidential election had gone on November 4. A large electric monogram "C-D" was mounted around the thirty-third floor of the Union Central Life Insurance Company building, one monogram on each of the four sides, to flash the returns. "C" stood, of course, for Coolidge and "D" for Davis. The top

of each letter was 495 ft. above the street level. The letters were built in sections, each letter being 12 ft. high by 10 ft. wide and containing sixty 25-watt lamps mounted in porcelain receptacles, which were fastened to boards 6 in. wide. The light was flashed on and off at half-minute intervals on all four sides of the tower. The installation was made under the direction of W. C. Winall, chief electrician of the building.

Minnesota Power & Light System Will Serve Fourteen Counties.—One of the most extensive electric projects ever undertaken in northern Minnesota will be completed early in December according to word received from the Duluth office of the Phoenix Utilities Company. The power system developed by this company for the Minnesota Power & Light Company at the cost of $20,000,000 will serve fourteen counties, and six rivers will contribute power — the Mississippi, St. Louis, Kwishwi, Kettle, Crow Wing and Fish Hook. The high-tension line from Blanchard to Nashwauk, the last link to be completed, extends for 126 miles and will have a voltage of 110,000.

Oklahoma Utilities Association Compiles Electric Service Statistics.—A list of all cities and towns in Oklahoma having electric service, revised to November 1, is issued by the Oklahoma Utilities Association. This useful compilation is divided into four classes, as follows: A—Operates municipal plant; B—Buys electricity wholesale from private company at town border, city switchboard or over municipal transmission line; C—Purchases electricity from municipal transmission line connected to municipal plant; D—Private company owns local distribution system and supplies energy through local plant or transmission line. Class D outnumbers the others combined by more than two to one.

Alabama Power Company May Extend Lines Into Mississippi and Acquire Georgia-Alabama Company Through Subsidiary. — The Mississippi Power Company has been formed, with J. M. Berry as president, in affiliation with the Alabama Power Company, which, it is understood, is planning the extension of its lines into Mississippi. The Gulf Electric Company, also affiliated with the Alabama Power Company, has applied to the Alabama Public Service Commission for permission to purchase the properties of the Georgia-Alabama Power Company and the Georgia-Alabama Utilities, Inc. About $500,000 is said to be involved in the transaction. The Georgia-Alabama company, with headquarters at Albany, Ga., serves Eufaula and several other places in southern Alabama as well as Georgia territory.

Hydro-Electric Possibilities at Cameron Falls, in Western Ontario.—The engineers sent out by the Ontario Hydro-Electric Power Commission to report on the possibility of diverting northern waters into Lake Nipigon to make possible further development of power at Cameron Falls have completed their survey and will make their report to the commission soon. When Sir Adam Beck was in Port Arthur a year ago he mentioned the possibilities for power development involved in cutting through a section of the height of land north of Lake Nipigon and by so doing releasing waters into the lake. At that time he said that the commission would spend upward of $15,000,000 in the Lake Nipigon section in the next five years. December 15, 1925, is the date set for the completion of the fifth and sixth units of the development at Cameron Falls. Four units are now operating.

Railroad Electrification in New York City.—There will be a hearing before the New York Public Service Commission in New York City on December 15 on the proposed electrification of the Putnam division of the New York Central & Hudson River Railroad from Sedgwick Avenue, Bronx, northerly to Getty Square in Yonkers and the Port

Morris branch on the Harlem division. This electrification will be an extension of the present electric service on the railroad's passenger tracks between New York City and Harmon. On December 16 the commission will hear the petition of the New York Connecting Railroad Company for the electrification of its tracks within the city of New York from Bowery Bay Junction on Long Island to Fresh Pond Junction, where connection is made with the Long Island Railroad. The railroad is already electrified from Oak Point yard, where it connects with the New York, New Haven & Hartford Railroad, to a connection with the Pennsylvania Railroad at Sunnyside yard.

Elephant Butte Dam May Serve in Production of Power.—In order to determine whether or not a hydro-electric plant, to cost between $3,000,000 and $5,000,000, shall be constructed in connection with the United States land reclamation project at Elephant Butte Dam, which forms a water-storage reservoir for irrigating big areas of land in the upper Rio Grande Valley, a survey of the market for electric power will be made this month by Barry Dibble, electrical engineer of the United States Reclamation Service, with headquarters in Denver. It is stated by Joe W. Taylor of Las Cruces, N. M., president and manager of the Elephant Butte Irrigation District, that $7,000 has been spent this year in making plans and specifications for auxiliary storage dams to serve the proposed hydro-electric plant. It is estimated that the cost of constructing power transmission lines will be about $7,000 a mile. He said that the proposed power transmission system would connect with those already in existence between Las Cruces and Fabens, Tex., including the lines of the Stone & Webster interests serving territory in and near El Paso.

California Oregon Power Building Another Klamath River Plant. — The major job now under construction by the California Oregon Power Company is a second power plant on the Klamath River, about one mile down the river from the "Copco No. 1" plant, which was completed last summer. "Copco No. 2" will be rated at 40,000 hp. The dam will be 145 ft. long at the crest and 30 ft. thick at its base and will be of reinforced concrete. Two tunnels, one 2,440 ft. long, the other 1,105 ft., each 16 ft. in diameter, will be of the horseshoe type, concrete-lined and reinforced. A wood-stave pipe, 16 ft. in diameter and 1,345 ft. long, will connect these tunnels. The power house, built of structural steel, will be 53 ft. wide, 105 ft. long and 60 ft. in height. It will house two generating units, each consisting of a 20,000-hp. turbine and a 15,000-kw. vertical-type generator. No provision is being made for the installation of additional units at this plant. Copco No. 2's tangible tie with its principal customer, the Pacific Gas & Electric Company, is a transmission line which extends from the plant south to Delta, Cal., a distance of 77½ miles, the completion of which was noted on page 1175 last week.

Men of the Industry

E. G. Dunlap New Vice-President in Youngstown

Elton G. Dunlap, who was elected vice-president of the Pennsylvania-Ohio Power & Light Company and the Pennsylvania-Ohio Electric Company, Youngstown, Ohio, to succeed the late Randall Montgomery, as was announced in last week's issue of the ELECTRICAL WORLD, was born near Youngstown in 1881. He first entered the employ of the railway and electric companies in 1901 in the accounting and treasury department and rose through various grades till he was elected treasurer of the properties in 1910. He has held that office since and continues now as treasurer as well as vice-president. The two companies operate the power and light properties in Youngstown, New Castle, Pa., Sharon, Pa., and elsewhere in eastern Ohio and northwestern Pennsylvania and interurban and city railways and coach lines in the same territory.

E. G. DUNLAP

George F. Otis, president of the Central Trust Company of Illinois, has been elected a director of the Illinois Power & Light Corporation, Chicago.

Ross R. Coddington, who has been associated with the Niagara Falls Power Company since 1892, has been elected vice-president of the company and made works manager.

George T. Buckingham, of the law firm of De Frees, Buckingham & Eaton, has been elected a director of the North American Light & Power Company, Chicago.

Charles N. Thompson, recently elected first vice-president of the Indianapolis Light & Heat Company, has been a director and chief counsel of the company since 1913. He is a native of Indiana and a graduate of De Pauw University. Mr. Thompson is one of the most active and generally known attorneys in Indianapolis and is connected with many of the city's best-known business and financial institutions. He has been a director of the Fletcher Savings & Trust Company for twenty-nine years and was one of the organizers of the Marion County Title Guaranty Company. He is a vice-president of the Indiana Savings Investment Company and a director of the Fletcher Avenue Savings & Loan Association.

H. N. Wood Commercial Manager of Penn-Ohio System

H. N. Wood, who has been appointed commercial manager of the Pennsylvania-Ohio Power & Light Company, Youngstown, Ohio, and associate companies has been with the Penn-Ohio System for the last ten years. Mr. Wood is a native of Vermont and was graduated in the electrical engineering course at the University of Vermont in 1911. Following graduation he was employed by the Westinghouse Electric & Manufacturing Company at East Pittsburgh, Pa., and later was with the Duquesne Light Company, Pittsburgh. In 1914 he became associated with the Pennsylvania-Ohio Power & Light Company in the power sales department. This connection continued till August, 1917, when Mr. Wood entered the army service, becoming a captain. Upon his return to civil life in July, 1919, he was appointed power sales manager of the Pennsylvania-Ohio Power & Light Company, and three years later he was promoted to be manager of the new-business department. In his new position he is in charge of all power and light sales and allied activities.

Mr. Wood has been active in the Ohio Electric Light Association, serving as chairman of the new-business co-operations committee. At present he is chairman of the power committee of the new East Central Geographic Division of the National Electric Light Association, covering Ohio, Kentucky and West Virginia.

W. C. Walton of Ashland, Wis., has been appointed manager of the electric properties of the Lake Superior District Power Company at Washburn to succeed Russel Bowles, transferred to Mellen.

David S. Wegg of Chicago has been appointed assistant chief of the electrical equipment division of the Bureau of Foreign and Domestic Commerce, according to an announcement made by Director Julius Klein. A graduate of Cornell and the University of Utah, Mr. Wegg has a broad background of practical experience as a mining electrical and sales engineer, having served successively with the Telluride Power Company and its subsidiaries as a construction engineer, station superintendent and supervisor of hydro-electric installations; with the

United States Army Ordnance Department as assistant chief operator of subcontracts for the Chicago district, with the Isko Manufacturing Company as special investigator, with the Allis-Chalmers Manufacturing Company of Milwaukee as special sales executive and with Gilchrist & Company of Chicago as a consulting engineer. As manager of the Havana office of Gilchrist & Company for the past four years, Mr. Wegg has been primarily engaged in a study of the engineering phase of the sugar industry and has specialized on the combustion of low-grade fuels.

Three Recently Elected Vice-Presidents of the New York Edison Company

Arthur Williams, who was recently elected vice-president of the New York Edison Company in charge of commercial relations, has been affiliated with electrical interests in New York City since 1885, when he entered the employ of the New York Edison Company as assistant in the chemical meter department. Serving successively as superintendent of interior construction, electrician when the company was operating only the Pearl Street station, superintendent of the third district, superintendent of the underground department and general inspector, he was appointed general agent in 1893 and in 1915 was promoted to be general commercial manager, which position he has occupied until his recent election to the vice-presidency. In recognition of his long period of service he was elected last spring to the board of directors of the company. Mr. Williams has always taken an active interest in civic movements, promoting especially safety and welfare work, and for his accomplishments in this field he has been decorated by the French and Spanish governments. He has been the recipient of the highest honors that the electrical industry can bestow, being a past-president of the National Electric Light Association, the Association of Edison Electric Illuminating Companies, the New York Electrical Society and the New York Electrical League. In addition, Mr. Williams is a director and member of many other industrial organizations, including the National Safety Council, the Chamber of Commerce of the State of New York and the Real Estate Board of New York.

ARTHUR WILLIAMS

PHILIP TORCHIO

H. M. EDWARDS

Philip Torchio, new vice-president in charge of electrical engineering, has been associated with the New York Edison Company since 1895, when he became engineer of economics. He spent six years in this office before he was promoted to the position of engineer of distribution, subsequently being appointed chief electrical and construction engineer of the New York Edison and allied companies. Mr. Torchio is a native of Vercana, Como, Italy, and a graduate of the University of Pavia. Later he received the M. E. and the E. E. degrees from the Royal Polytechnic of Milan. He has to his credit numerous patents for ground and fault detectors for electric distribution systems, insulating covering for cables and automatic circuit breakers, and he is the author of many papers contributed to the proceedings of electrical societies and of articles contributed to the technical press. Mr. Torchio is a fellow of the American Institute of Electrical Engineers and a member of the National Electric Light Association, the Illuminating Engineering Society, the New York Electrical Society, the Franklin Institute and the Associazione Elettrotecnica Italiana.

Harry M. Edwards, who was elected vice-president in charge of accounting at the recent meeting of the board, entered the employ of the New York Edison Company in 1901. A native of New York City and a graduate of its public schools and the College of the City of New York, Mr. Edwards became identified with the electrical industry in 1889 as bookkeeper for the Manhattan Electric Light Company and its affiliated company, the Harlem Lighting Company. After a short period as bookkeeper he was made auditor and subsequently was elected secretary and made a director of the two companies. Later, following the merger of the Manhattan and Harlem companies with the Edison Electric Illuminating Company, he was appointed auditor of the Edison organization, assuming in addition the duties of auditor of the New York Gas, Electric Light, Heat & Power Company soon after its organization. It was in 1901 that these two companies were consolidated to form the New York Edison Company. Mr. Edwards has been prominently connected with the National Electric Light Association and the Association of Edison Illuminating Companies for a number of years and has contributed papers to their proceedings.

Dr. William F. Durand, who was elected president of the American Society of Mechanical Engineers, as was announced in a recent number of the ELECTRICAL WORLD, took office on Friday, December 5. Dr. Durand is a graduate of the United States Naval Academy and has been professor of mechanical engineering in Stanford University since 1894. He is an author of some note on mechanical engineering subjects and has been a frequent contributor to the technical press. Dr. Durand is a member of the American Institute of Electrical Engineers, the American Society of Naval Engineers, the National Research Council, the National Academy of Sciences and of other scientific organizations.

Philip M. Wentworth, formerly manager of the Fort Madison (Iowa) Electric Company and the Dallas City (Ill.) Light Company, has been appointed manager of the Keokuk (Iowa) Electric Company to succeed Walter M. Bird, transferred to Paducah (Ky.). Previous to his connection with the Fort Madison utility, Mr. Wentworth was assistant manager of the Truckee River Power Company, Reno, Nev.

Phil F. Toman has been appointed sales manager of the Peerless Electric Company, Warren, Ohio. Before affiliating himself with the Peerless company he was identified with the Horton Manufacturing Company, Fort Wayne, Ind., in the capacity of advertising and sales promotion manager. Mr. Toman was previously associated with the General Electric Company in charge of advertising and sales promotion for the fractional-horsepower-motor division at the Fort Wayne plant.

Commission Rulings

Justifiable Discrimination.—"Dump" Power Service.—Although the fact that an electric utility company has offered service at less than cost does not justify continuance of the practice, none the less, observed the Oregon Public Service Commission in establishing a rate schedule for the Idaho Power Company, a provision that old users of electricity may continue such use, until an expiration date fixed by the commission, at a lower rate than a new customer who is fully advised of the proper cost of such service, while discriminatory, is not unjustly discriminatory when approved to avoid loss to customers from the enforced scrapping of heating equipment purchased under an offer of low electric rates. A "dump" power schedule of electric service, the commission held further, although justifiable where surplus power is available, should not be offered in an interconnected electric system when this would be at the expense of customers on other schedules. The purchase of electrical energy on the basis of a percentage of the gross revenues received from customers was also condemned as conducive to waste and to the offering of flat-rate service at extremely low rates, and this condition should be corrected.

Contracts and Police Power of State in Virginia.—A declaration that contracts covering the street-railway rates of the Virginia Railway & Power Company were not in derogation of the police power of the state, since they were not made in pursuance of express authority in the constitution under which the police power of the state might be alienated and were, therefore, subject to modification by that department of the state government possessing the police power with the consent of the public service corporations, has been made by the Virginia State Corporation Commission, which said: "The conclusion from the Virginia authorities seems to be clear that any contract, however valid when made and though binding between the public service corporation and the municipality, is subject to the power of the state in the exercise of its reserved police power as to the prescribing of rates for public service corporations in the interest of the public and in view of changed conditions, in the absence of express constitutional authority to a city to make a binding contract in limited and reasonable derogation of such power. In other words, the state can forego such power in favor of a municipality only in pursuance of express authority in the state constitution. Therefore, the alleged legislative contracts and legislative confirmation of franchises are subject to the reserved police power, since they were not enacted in pursuance of express authority in the then existing constitution of the state. It is well settled that one legislature cannot as to the general legislative power of the state bind another except by valid contract, and it is equally well settled as a matter of course that the Legislature cannot bind a department of government, namely the State Corporation Commission, upon which a subsequent constitution confers the exercise of the police power of the state, any more than one legislature could bind another as to the exercise of police power. If, therefore, the State Corporation Commission now possesses, as we believe it does, the police power of the State of Virginia as applicable to the instant case, it possesses it as untrammeled, except in so far as there are constitutional limitations, as the Legislature itself possessed it prior to the constitution of 1902."

When an Electric Utility Is a Common Carrier.—In granting to the Indiana Electric Corporation the right to condemn an easement for its power lines over the interurban railway lines of the Terre Haute, Indianapolis & Electric Traction Company—a dispute that led to the litigation noted in the ELECTRICAL WORLD for June 21, page 1303—the Indiana Public Service Commission said in reference to a contention of the traction company that its opponent also was a common carrier and therefore debarred from condemning the desired crossings, that a corporation doing business as an electric utility and also having the right under its charter to do an interurban railroad business, but not engaged in such business, is not a common carrier engaged in the transportation of freight or passengers within the meaning of the Indiana statute excluding such common carriers from the right to condemn property.

Inductive Interference and Priority of Construction.—In an order designed to eliminate inductive interference by the lines of the Pacific Gas & Electric Company with the Postal Telegraph Cable Company the California Railroad Commission said: "The method of dividing the cost between utilities whose lines are involved in a parallel, and which require reconstruction, relocation or other changes, heretofore followed by this commission has been to require the utility in whose plant any capital addition is made to bear the cost of that added plant, and that changes other than capital charges in either the power or communication circuits, including the cost of remedial measures, be paid for by the party creating the parallel, and the cost resulting from the planning or determination of the necessary remedial measures be paid for by the utility making the same. The evidence in this proceeding shows that both the power and communication circuits have been in operation for many years and long before the question of inductive interference was given serious consideration. Since that time changes have been made by both utilities in their circuits. In view of the history of the lines involved in this matter, it does not appear that the question of priority of construction should be given material weight in determining the responsibilities of payment of costs resulting in the mitigation of interference. The commission is satisfied, however, that serious interference does result to the communication circuits due to the operation of the power circuits and that satisfactory operating conditions of the communication circuits can only be obtained by eliminating the small separation now existing between Davis and Elmira and also in the vicinity of Vandeen, and that the cost to eliminate this serious condition should be borne equally by the Postal and Pacific companies."

Recent Court Decisions

Municipal Powers Over Utilities in Oklahoma.—The decision of the Oklahoma Supreme Court in City National Bank of Fort Smith vs. Town of Kiowa touches the subject of municipal powers and the authority of municipal officials over public utilities. Where the voters of a municipality are asked to give their assent to the conveyance of a municipally owned water and light plant and to grant a franchise to the purchaser, under the referendum provisions of the constitution of Oklahoma, the court holds that the extent of the authority thus granted to municipal officers is limited by the terms of the proposal and of the franchise ordinance submitted at the election. The public policy of the state forbids that public utilities shall be willfully destroyed or that public funds shall be diverted from the purposes for which they are voted. Where waterworks and electric light systems have been constructed from the proceeds of a bond issue authorized by the constitution public policy forbids that private rights shall be acquired therein the enforcement of which would have the result just stated.

Police Power Defined.—Sustaining the right of the Oklahoma Corporation Commission (ex parte Tindall) to regulate motor vehicles for hire, the Supreme Court of Oklahoma declared that the Fourteenth Amendment of the United States Constitution does not interfere with the proper exercise of the police power of the several states, which is thus defined: "The police power is an attribute of sovereignty, inherent in every sovereign state, and not derived from any written constitution nor vested by grant of any superior power. The term 'police power' comprehends the power to make and enforce all wholesome and reasonable laws and regulations necessary to the maintenance, upbuilding and advancement of the public weal and protection of the public interests. It is plastic in its nature and will expand to meet the actual requirements of an advancing civilization and adjust itself to the necessity of moral, sanitary, economic and political conditions. No principle in our system of government will limit the right of government to respond to public needs and protect the public welfare." (229 Pac. 125.)*

*The left-hand numbers refer to the volume and the right-hand numbers to the page of the National Reporter System.

Manufacturing and Markets

National Electrical Code

Plans Announced for 1925 Edition Proposals for Additions or Amendments Requested

THERE will be a 1925 edition of the National Electrical Code, which embodies the rules and regulations for electric wiring and apparatus. This was determined at a meeting of the reorganized sectional electrical committee of the National Fire Protection Association, held in New York City on Friday, November 21, 1924. Any one having proposals for additions or other amendments to the National Electrical Code, edition of 1923, can be assured of full consideration if these proposals are submitted in writing to the chairman of the committee, A. R. Small, 109 Leonard Street, New York, not later than December 15, 1924. Such proposals should preferably refer to a particular article and paragraph of the 1923 edition and shall in all cases be readily identifiable as to the name, address and interest of their submitters. When filed such proposals will be referred to the appropriate article subcommittee for detailed study.

At the meeting action was taken to enable the committee to function thereafter as a sectional committee under the rules of procedure of the American Engineering Standards Committee. The next meeting of the reorganized committee will be held in New York City, February 17, 18 and 19, 1925, at which time reports of article committees will be acted upon with a view to the appearance about mid-year of a 1925 edition of the National Electrical Code. The committee's report will be presented at the annual meeting of the National Fire Protection Association, which will be held in Chicago early in May.

The association, as sponsor for the code, will then file the revised code with the American Engineering Standards Committee for listing as an approved American standard. It will be published and distributed by the National Board of Fire Underwriters as with previous editions.

In addition to the National Fire Protection Association, fourteen organizations, national in character or representative of government and general interest, will be represented on the committee as follows: American Electric Railway Association, M. Schreiber; American Institute of Architects, Leroy Kern; American Institute of Electrical Engineers, Paul Spencer; Association of Edison Illuminating Companies, J. W. Cowles; Association of Electragists, International, Allan Coggeshall, A. Penn Denton; Associated Manufacturers of Electrical Supplies, C. A. Bates, H. R. Sargent; Bureau of Standards, M. G. Lloyd; Electric Power Club, W. E. Haseltine, R. W. E. Moore; Electrical Supply Jobbers' Association, Thos. Creaghead, W. A. Kennedy; Institute of Radio Engineers, Donald McNicol; National Association of Building Owners and Managers, C. T. Coley; National Electric Light Association, W. H. Blood, W. J. Canada; National Board of Fire Underwriters, John Ashmead; Underwriters' Laboratories, Dana Pierce, A. R. Small; Western Association Electrical Inspectors, W. S. Boyd.

Electrical Manufacturers Need Statistics

Lack of Knowledge of Total Production Sales and Stock Forces Reliance on Guesswork— Some Examples

JAMES H. McGRAW was invited to address the recent banquet of the Associated Manufacturers of Electrical Supplies on the subject of the need for industry statistics for the electrical manufacturer. Unexpected illness prevented Mr. McGraw being present, but this message was presented for him, carrying a definite suggestion for the clearance and publication of mass statistics on electrical manufactures through the *Electrical World*.

THE electrical manufacturing industry is becoming more and more embarrassed by the lack of knowledge of its markets and its own activities. Since there is a total lack of statistical information covering yearly production, stocks or sales that embraces all manufacturers of a commodity on a national basis, the electrical manufacturer is compelled to lay his plans by guesswork and approximation. He cannot look back over a record of the years and estimate the trend and gage the status of the market and set a quota for his own production for the coming year that bears relation to the known conditions. He is compelled to guess, and the extent of the variance between the guesses of men engaged in the manufacture of a kindred line is sometimes astonishing.

For several years, in the endeavor to impress upon the industry the natural interest and value of such statistics, the ELECTRICAL WORLD and *Electrical Merchandising* have been annually compiling statistics of the total sales of electrical manufactured products. The only practical basis on which such approximate figures could be compiled was to obtain from the leading manufacturer of each line an estimate of the total production of the commodities in which he was interested. This has been done with great care. Only men of acknowledged standing in the industry have been consulted. Estimates have been secured from the principals of each manufacturing organization. Each man has given an approximate figure according to his best knowledge and belief. Estimates or opinions have been received annually from approximately seven hundred sources within the electrical manufacturing industry. The individual estimates on each line have thereupon been compared and averaged on a carefully considered basis that seemed most likely to result in a safe and conservative estimate of the total production for each class of manufacture. But the difference in the opinions of these men engaged in the same line is often startling. For instance:

The records of the compilation of last January show that the estimates of the total sales of rubber-covered wire varied all the way from a minimum estimate of $60,000,000 to a maximum estimate of $90,000,000. The total sales of transformers were estimated all the way from a mini-

mum of $22,000,000 to a maximum of $42,000,000, both these being reckoned at the manufacturer's selling price. The total sales of fuses, as estimated by fuse manufacturers, ranged all the way from a minimum of $4,000,000 to a maximum of $9,000,000. Sales of rigid conduit were stated all the way from 90,000 tons to 150,000 tons. The number of dry batteries sold was placed all the way from 60,000,000 to 115,000,000. The sales of domestic heating appliances were quoted at various figures from a minimum of $14,000,000 to a maximum of $40,000,000. Sales of fans were estimated at a retail value all the way from $11,000,000 to $25,000,000. Washing machines were reckoned from a minimum of $55,000,000 to a maximum of $90,000,000.

These opinions were submitted by men who are considered in the electrical industry as authorities on the product which they were considering. Many men, however, refuse to give an opinion, saying that they had no basis whatever for making such an estimate, that they were not familiar with what the industry as a whole is doing. Only the very largest manufacturers, who maintain extensive and expensive statistical departments, claim to have any comprehensive knowledge as to the activities of the field as a whole; the rest are working in the dark.

What must be the inevitable result? Men who cannot look back over a record of past years and study the trend of markets are certainly seriously handicapped. Inevitably this situation must lead to mistakes of judgment in planning for production and for sales. One time it results in overproduction throughout an industry, with a consequent depression of prices. Another time it reacts in a shortage of production, which again brings a disturbance in trade, with much opportunity wasted. Each year, on the publication of these approximate estimates, there come into our offices a flood of letters that are a tragic evidence of the eager desire on the part of electrical manufacturers and distributors for more statistical knowledge of the electrical business. Men write in, commenting on the value of these figures to them, such as they are. They ask for additional information and discuss from a dozen angles the benefits that would follow the regular publication of adequate industry statistics.

All this has been long discussed among electrical manufacturers. The need is freely acknowledged, but there seems to be a fear in the minds of many that the publication of such statistics would result in undue benefit to competitors. Some of the smaller manufacturers seem to hesitate because of a belief that they would be disclosing to the larger manufacturers the amount of business which they are doing and would draw down upon them an increase in competition. Some of the larger manufacturers, in turn, feel that it would be unwise for them to give out information because the smaller manufacturers would see the greater volume of business which they are doing and become more eager in the market.

The electrical manufacturer, therefore, allows himself to stand in the false light of appearing to prefer to remain in ignorance himself rather than to give common information to a rival. Yet this is not the natural attitude of the electrical manufacturer at all, as is witnessed by the constructive progress he has made in recent years through harmonius individual co-operation and through association work.

As a matter of fact, the fallacy of both these arguments is apparent to any one who has had an opportunity to study the actual conditions. Letters received by us from time to time from the very largest manufacturers in the electrical industry evince the same lack of information when it comes to total figures on industry production stock and sales of individual commodities that the smaller manufacturer so frankly admits. Clearly the electrical manufacturing industry needs and desires an adequate statistical knowledge of its own affairs, and there seem to be but two ways to accomplish the desired end.

TWO METHODS POSSIBLE

Such statistics under the law may be gathered by a trade association and submitted to the United States Department of Commerce for official publication, or they may be published in the newspaper of the industry as public information. Clearance through the government is naturally beset by embarrassing doubt as to who may follow Herbert Hoover in future years, and whereas the electrical manufacturer might be willing at the present time to contribute his own production figures for compilation in Washington, there is a natural reluctance to embark upon a venture which ultimately might prove a troublesome invitation for government interference in business. For the other course there is an interesting precedent that provides a very practical demonstration.

Ten years ago there was no more information available as to the output of the electric light and power industry than there is today of the output of electrical manufacturers. Each utility executive considered his company's statistics as his own affair, but at the same time this information seemed also to be so palpably the affair of the industry at large that the ELECTRICAL WORLD set itself the task of winning the co-operation of the public service companies in the compilation of national statistics on the output of electric power and the growth of utility systems.

Today the gathering, the compilation and publication of these statistics of the electric power industry has become continuous and systematic and embraces practically the entire central-station system of the United States and Canada. This information is received in confidence and is published

G. E. Makes Stock Appropriation

THE General Electric Company has recently appropriated $3,500,000 for manufacturing stock to lessen unemployment. The following statement on the appropriation was made by Gerard Swope, president of the company, to the ELECTRICAL WORLD:

During this year the orders of the General Electric Company decreased from $71,220,000 in the quarter ended June 30 to $58,390,000 in the quarter ended September 30.

To ameliorate the condition incident to the laying off of a large number of old and valued employees, the company authorized the placing of orders on the factory in the amount of $3,500,000, this apparatus to be manufactured during the period of diminished business and put in stock. This appropriation applies to all the plants of the company producing apparatus that can be stocked and for which there will be a demand as business revives. This will not only have the effect of keeping more of our men employed, but will also place the company in a position to serve its customers better.

as mass statistics. It is a service that might very easily be extended to embrace statistics of electrical manufacturing production also. Since the press is an institution of the industry itself, no such doubt as exists in the case of government clearance injects itself. As the newspaper of the industry the ELECTRICAL WORLD can receive and compile the statistics of the manufacturer with the same accuracy and in the same strict confidence that it has for years exemplified in gathering and analyzing the statistics of the power companies, and it can publish them periodically as news rather than as history. Though it might be necessary to begin the publication of such statistics in a small way, yet if a known proportion of the total production of any important commodity became a matter of current knowledge, the value of the service would rapidly demonstrate itself and gain in acceptance until it gradually embraced the full scope of the important commodities.

The compelling thought, in the consideration of this whole situation, should be this—that in an industry wherein so great an opportunity lies waiting no man should stand in the way of knowledge. There is market enough for all. Moreover, every electrical manufacturer must recognize his individual responsibility to the American public to further energetically, in every possible way, the more rapid equipment of the home, stores, factories and farms that are still waiting in part or in whole the coming of electric service. With so great a market lying fallow no man should worry about what his customer may find out. Rather, he should desire him to know the facts and act more wisely.

German Foreign Trade

IN VIEW of Germany's former strong position in the electrical export market, the attitude of the present German government in sparing no pains to assist German export trade in every particular and to improve the national foreign trade balance will be of interest to electrical manufacturers. "A campaign for increasing German sales abroad is now under way," says Trade Commissioner Miller in a report to the Department of Commerce, "and the government is aiding by increasing credits, cutting freight rates and communication charges, reducing onerous taxation, lowering the discount rate on foreign bills, negotiating new commercial treaties, reorganizing the consular and diplomatic services and establishing closer relations with German chambers of commerce in foreign countries."

Private firms are also coming into line. The gold discount bank has reduced its rate to 8 per cent; the Ruhr coal syndicate dropped its prices on October 1 by 10 per cent; the nitrogen syndicate has reduced its prices to 20 per cent below prewar, while the potash syndicate, after its agreement with French producers, announces a more liberal discount policy to small customers in foreign countries.

Government Analyzing Markets by Regions

ADDITIONAL aid in solving some of the more complex problems of distribution through the compilation of scientific data is afforded as a result of a new series of regional market studies recently inaugurated by the Domestic Commerce Division of the Department of Commerce. The first of these studies, embodying a complete and thorough survey of the market territory tributary to Philadelphia, has just been completed and will probably be released in pamphlet form about the first of the year. A second survey, covering the Atlanta area, is now being mapped out, and the work on this will be started some time in December.

In commenting on the results, A. Heath Onthank, chief of the Domestic Commerce Division, stated that the Philadelphia survey has brought out many interesting and valuable facts. "For example, it has been ascertained," he says, "that wages paid to farm labor in the Philadelphia district are almost 50 per cent higher than those paid in the United States at large. The effect of this knowledge on dis-distributors of goods which appeal to farmers and their help is obvious.

"The scientific phases of distribution have never been adequately treated," according to Mr. Onthank, "but within the last few years more attention has been given to scientific methods of distribution. This work of the Department of Commerce will not only be of current value but will serve as a basic groundwork for more extensive studies."

Business Conditions

EVIDENCE continues to be received that many projects are now being proceeded with that were formerly inactive. Central stations have many negotiations under way, and the volume of sales transacted is steadily growing. Industrials are entering the market more and more, and many new requests for quotations on extensions have been received. It is noticeable that industrial firms are not so averse to purchasing material for stock. Building construction is active throughout the country, with a good demand for correlated electrical material.

In New England there has been an increasing volume of highly diversified business, and motor sales continue to improve. A heavy sleet storm in this district caused widespread damage, resulting in replacement orders for poles, cross-arms, wire and insulators. Activity continues in the New York district with increasing sales. A prominent manufacturer in this territory reports that November sales have been the largest for the year. In the Southeast there is considerable activity in the central-station field for line construction materials, and the volume of sales is increasing. Central-station expansion is moving forward, and maintenance purchases have increased materially in the Middle West. On the Pacific Coast building construction is active, with good sales of wiring devices and supplies.

Portable Tools in Good Demand —Prices Firm

A PROMINENT manufacturer reports that the demand for portable electric tools is greater than it ever has been. Another manufacturer says that the demand since the first of October has shown a good increase. The present market for portable electric tools has been the result of the development of new uses and the constant education of the trades as to their diversified uses and their superiority over the old-established hand methods. A favorable volume of business has been transacted by portable-tool manufacturers all this year as practically ever known type of industry uses electric tools and although some were very quiet others were purchasing in fair quantities. Future sales are expected to present even greater possibilities than realized before.

Immediate deliveries are being made on all sizes and types since deliveries are made from stock and raw-material shipments are very satisfactory. Prices are firm and no changes are antici-

pated as successive price reductions have brought the price to a low level, and unless some unforeseen condition arises no immediate advance is in sight.

Copper Increases in Price—Large Sales Made

COPPER gradually advanced to 14¼ cents, and record sales have been made during the week. Moderate tonnages of zinc have been sold, but the demand for lead and tin has been somewhat less, though prices are holding firm. Large and careful buyers have entered the copper market at present levels, and this has encouraged producers. Six sellers report a total of 52,000,000 lb. of copper sold in four days. Continuous buying has persisted during recent weeks, and apparently consumers are no longer following their habit of trying to enter the market at once

NEW YORK METAL MARKET PRICES

	Nov. 26, 1924 Cents per Pound	Dec. 3, 1924 Cents per Pound
Copper, electrolytic	14	14¼
Lead, Am. S. & R. price	8.65	8.65
Antimony	14½	14½
Nickel, ingot	29½	29–30
Zinc, spot	7.25	7.40
Tin, Straits	54¼	55
Aluminum, 98 to 99 per cent	28	28

and then not buying any thing for a month or so while prices react. The foreign demand has been good especially from Germany.

Lead has been somewhat quieter, with the price remaining firm. Little lead has been sold by outside interests. December metal is scarce, but consumers seem to be well provided for until January. Zinc increased in price to the highest level since April, 1923. Good domestic and export buying of the metal continued during the week. The tin market has been quiet with little price variation, and buying has been confined to small tonnages in general.

Diversified Trade Developing in the New England Territory

NEW ENGLAND trade reports in the electrical field continue to feature an increasing volume of highly diversified business, nearly all lines being active with the exception of those distinctly out of season. A heavy sleet storm last week caused widespread damage to telephone and other public utility lines in northern New England, and early replacement orders to refill emergency pole, cross-arm, wire and insulator stocks are anticipated. The New England Telephone & Telegraph Company alone lost about a thousand poles, and central-station distribution circuits in lower New Hampshire, Maine and northern Massachusetts suffered considerably. Line extensions have been greatly reduced by the advent of winter, but next year's needs are receiving attention in executive budgets.

The United Electric Light Company, Springfield, Mass., has purchased about $90,000 worth of underground cable within the past few days. A fair volume of wiring supply purchases by contractors is reported. Electric motor sales continue to pick up, and recent orders include about 400 hp. in varied units up to 40 hp. from a New Hampshire shoe factory, a group of motors aggregating 150 hp. for a New Hampshire lumber plant and 150 hp. in motors for a hosiery mill. The smaller electrical appliances are selling with increasing speed, representative companies running 25 per cent ahead of last year. A prominent vacuum-cleaner distributor sold 1,000 machines to the Boston Edison company and 150 to the Worcester Electric Light Company on Monday, with the result that a shortage of this make by December 15 is not unlikely.

Maintenance Purchases Increase in the Middle West

BUSINESS continues good throughout the entire Middle West, central-station expansion going forward and maintenance purchases having increased materially. One utility in the Southwest placed a good-sized order for aluminum wire and high-tension insulators. Very little major apparatus is being bought, although the demand for auxiliary equipment, poles and pole-line hardware has been quite active. Manufacturers of high-tension equipment report a very satisfactory month during November.

Holiday purchasing has started, and many jobbers are putting in large stocks of electrical appliances. One jobber placed several orders for appliances to be delivered before the first of the year totaling approximately $50,000. This was in addition to a similar order placed about two months ago. Radio sales have accelerated, but deliveries of certain types of radio equipment are very indefinite and inadequate. The present cold weather has retarded building somewhat, although the number of permits issued this week (322, with a valuation of $8,925,000) exceed those of a year ago (303, with a valuation of $6,161,350).

Volume of Sales Continues to Increase in the Southeast

THE trend of general business in the Southeast is living up to predictions made in the early fall that the volume of sales would continue to increase steadily but not in a spectacular manner throughout the balance of the year. The demand for building materials is very good, and several large industrial jobs which are expected to mature within the next thirty days are now being figured. Considerable activity is reported in the central-station field for line-construction materials, and good-sized orders will be let within the next two weeks.

Several inquiries received for high-tension transformers of from 11,000 volts to 38,000 volts indicate that material improvement will soon be evident in this material. Orders for small motors, though scattered, are in the aggregate satisfactory. Street-lighting equipment slowed up during the past few weeks after several months' activity, but prospects for future business are good. Heating devices are moving briskly, with flatirons by far the most active item, though sales of air heaters have been unusually good.

Activity Continues in New York District—November Sales Up

BUSINESS remains active in the New York district, with indications of a steady improvement. A prominent manufacturer reports that his sales in this district, for November were larger than for any previous month during the year. Negotiations by central stations are actively under way for material and equipment, and there is more evidence of a desire to purchase material. Among recent orders is one for $250,000 worth of watt-hour meters and one for $200,000 worth of circuit-breaker equipment received by the Westinghouse Company. An order for switchboard equipment totaling more than $1,000,000 has also been received by the General Electric Company. There is a fair demand for high-tension equipment, but the majority of orders are coming from six companies who have a very large amount of work under way. Better sales, however, are expected soon to provide for the construction work that will, it is thought, develop in the spring. Transformers are in good demand, with several inquiries being received from industrials. There has been a steady increase in inquiries for motors, with distinct signs of better activity in this field.

Building construction is active, and there has been a corresponding demand for building material. Conduit sales have been very good and some jobbers have short stocks. The activity in the building field has been the cause of an increase of approximately 5 per cent in cross-arms, effective since December 1. Much good business is in sight for cross-arms, poles and similar material.

Building Construction Active on the Pacific Coast

BUILDING construction on the Pacific Coast is showing a continued increase with a good movement of wiring devices and supplies. Among recent orders placed are one by a lumber company for 5,000 lb. of round and rectangular magnet wire, in forty-five assorted sizes, two orders for over 100 miles each of galvanized-iron telegraph wire and 100 pike poles for utility companies. The service problem, which was causing much keen concern about a year ago because of its alarming increase in cost, has been apparently alleviated by a regular time table of scheduled deliveries by jobbers and a motorcyle delivery of small orders handled by a special department.

The city of Tacoma will award contracts within the week for furnishing $60,000 worth of insulators, pole-line hardware, etc., for a transmission line to Lake Cushman, also for a complete wired-wireless telephone system to operate between Tacoma and the Cushman project, the latter to cost about $10,000. The Puget Sound Power & Light Company is also expected to start buying for the Baker River development around January 1. Retail trade has been exceptionally good, having been augmented by the very good crop receipts. Export business is fast becoming stable, and the September volume has exceeded all records for the past four years.

Activities of the Trade

Sanford Riley Stoker Company Enlarges Detroit Factory

To care adequately for the constant growth of its business, the Sanford Riley Stoker Company, Worcester, Mass., is enlarging and improving its plant at Detroit. An addition is being built to the main erecting shop which will double its present capacity, this being required principally because of the increasing demand for combustion apparatus for the larger-sized boilers. The foundry is also being enlarged and new equipment provided which will make this installation one of the most modern in the country.

Chicago Concrete Post Company Doubles Capacity

The Chicago Concrete Post Company, Lawrence and Lamon Avenues, Chicago, is now turning out between 100 and 125 concrete poles per twenty-four-hour day, following the increase in plant capacity made this fall. This expansion was required, according to Paul K. Fleming, president, by the growing demand for concrete poles. The company was recently awarded a contract for more than 5,000 poles by the city of Chicago for rehabilitating its street-lighting standards.

Wagner Electric Enters Field of Fan Manufacture

The Wagner Electric Corporation, St. Louis, which for more than thirty years has been building Wagner motors, has now entered the field of fan manufacture. Wagner fans, now being placed on the market for the first time, are the result of long study and experiment. The fan blades are said to be especially designed to eliminate buzz, and some of the features are a convenient carrying handle, lightness and strength, handy oscillation adjustment and safety oscillation release. Complete specifications of all models and data covering sales features, plus useful selling suggestions, are contained in the new Wagner fan catalog, now in course of preparation.

Standard Price Book and Sales Agencies for Ryan & Company

After nearly four years of experimentation and development, F. J. Ryan & Company, Philadelphia, have finally consolidated a group of nearly fifty standard industrial heating units, covering almost every small equipment demand of the industrial heating field. This list includes the "Mircs" burner and the "Ryan-Austin" method of automatic temperature control. These units are now being assembled into a standard-price book, and with the coming of the new year it is the company's intention to establish agencies for their sale. The agency agreement will not control any of the engineering work or large furnace negotiations, as the company has found that it takes an experienced engineer to handle these inquiries properly. The standard units will be constructed at Ryan & Company's works in Lancaster and shipped complete with guarantee.

Locke Insulator to Establish New District Offices

Effective January 1, 1925, the Locke Insulator Corporation, Victor, N. Y., will establish three new district offices. One will be at 766 Illinois Merchants' Bank Building, Chicago, in charge of A. M. Jackson; another will be at 803 Atlantic Building, Philadelphia, in charge of J. G. Dellert, and the other will be at Victor, N. Y., in charge of A. G. Benard. The territory comprising Pennsylvania, New Jersey, Delaware, Maryland, West Virginia, Virginia, Ohio, Kentucky, Michigan, Indiana, Illinois, Minnesota, Missouri, Arkansas, Kansas, Wisconsin, Nebraska, North Dakota, Iowa and South Dakota, in which the company has been formerly represented by the Electric Service Supplies Company as agent, will now be taken over and covered by these new district offices.

The company also announces that since December 1 its sales department, in charge of B. A. Plimpton, and its engineering department, in charge of K. A. Hawley, have been in the Maryland Trust Building, Baltimore, along with its executive offices.

Westinghouse Reports Increased Orders for Power Transformers

The Westinghouse Electric & Manufacturing Company reports an encouraging increase in the power-transformer business for November, with sales for the month exceeding one-third of a million dollars exclusive of orders calling for less than $50,000 worth of equipment. The largest order for the month amounted to $112,000 and came from the Pacific Gas & Electric Company. This was for four 13,333-kva. transformers for operation at the Shasta station of the company's 220,000-volt system. The Central Georgia Power Company ordered eight 4,000-kva., 110,000-volt transformers, costing about $105,000. Other orders were also received from Ford, Bacon & Davis, engineers, and from the Arkansas Light & Power Company.

Edwin M. Herr, president of the Westinghouse company, in commenting upon the improved outlook, said: "While our incoming orders are some 13 per cent below the corresponding period a year ago, we are doing a substantial business—in fact, all we could expect in view of the greater proportionate losses that industrial companies in other lines have suffered. For the past two months bookings have reflected successive gains over the previous months."

In referring to the increase in transformer business Mr. Herr says that the Sharon works, which has neen recently placed in operation, have released space in the East Pittsburgh works which is now being utilized for the production of circuit breakers, a line which has developed with exceptional rapidity during the past five years.

The Standard Electric Stove Company, Toledo, Ohio, announces that Ogden & Denison, its Eastern sales representatives, are now at 112 West Forty-second Street, New York.

The Sylvania Products Corporation, Emporium, Pa., recently organized, has acquired the local plant of the Nilco Lamp Works, Inc., and is installing machinery and equipment for the manufacture of vacuum tubes for radio.

The Haynes & Kinder Company, 2250 West Chicago Avenue, Chicago, manufacturer of electric signs, displays, etc., has awarded a general contract to the Austin Company, 160 North La Salle Street, for the construction of a one-story plant at 2600 North Kildare Avenue, 120 ft. x 126 ft., estimated to cost in excess of $125,000 with equipment. Work will proceed at an early date.

The Remy Electric Company, Anderson, Ind., has during the last four weeks taken back on its payroll 600 former employees. The working schedule of the factory has been increased to five and one-half days of nine hours each in practically all departments.

The Star Electric Motor Company, Miller Street and New Jersey Railroad Avenue, Newark, N. J., announces that Edward S. Ford has been appointed its Cleveland representative with offices in the Rockefellow Building, Cleveland.

The National Carbon Company, Inc., 30 East Forty-second Street, New York, has let a contract for the construction of a one-story plant, 75 ft. x 120 ft., on East Tiffin Street, Fostoria, Ohio.

The Strom Ball Bearing Manufacturing Company, 4527 Palmer Street, Chicago, announces the appointment of Alfred G. Norris as manager of the New England office at 75 Pearl Street, Hartford, Conn. A. W. Wiese, sales engineer, has also been transferred from the Philadelphia office to the new office at Hartford.

The Chicago Pneumatic Tool Company has appointed H. E. Byer as manager of its condenser and vacuum-pump sales, with offices in New York City at the Chicago Pneumatic Building, 6 East Forty-fourth Street.

The Janette Manufacturing Company, Chicago, manufacturer of electric motors, etc., has acquired the seven-story-and-basement building, 40 ft. x 190 ft., now occupied at 556 West Monroe Street, for a reported consideration of $75,000 and will use the entire structure for production. Improvements are said to be under consideration.

The William Cramp & Sons Ship & Engine Building Company, Philadelphia, has been awarded a contract by Mitsui & Company, Ltd., Japan, for three

13,000-hp. turbines, with governors, intake pipe and penstock valves, to be installed in the Aso Rive station of the Cifu Electric Power Company, Japan.

The Cutler-Hammer Manufacturing Company, Milwaukee, Wis., announces the appointment of T. E. Beddoe, who was at one time connected with the Pittsburgh and Chicago offices of the company, as industrial sales engineer attached to the Philadelphia office. Paul Darlington, for the past four years in the industrial controller engineering department, has been transferred to the New York sales staff.

The Allgemeine Elektricitäts-Gesellschaft of Berlin has closed a contract with the Republic of Guatemala that provides for the construction of an electric power plant at Santa Maria in addition to an electric railway line from that city to Quezaltenango. The republic will issue bonds to the value of $3,000,000 to finance the work.

The General Electric Company announces that the construction of a wire-drawing plant has been started at Oakland, Cal. The building will be of brick construction, one story high, 120 ft. x 60 ft., and will be equipped for drawing, annealing and covering wire used for transformers and motor repairs. The building will be near the East Tenth Street entrance of the General Electric's factory in Oakland.

The English Electric Company will soon deliver to the Montreal Harbor Commission for use on the waterfront four 100-ton electric locomotives for operation on 2,400 volts, direct current. The complete equipment is said to have cost $478,650.

The Mine & Smelter Supply Company, Denver, jobber, has appointed J. D. Nicholson assistant manager of its Denver office. For the past five years Mr. Nicholson has been manager of the electrical department of the Salt Lake City branch of the company.

New Equipment Available

Four-Wire Three-Phase Meter

A three-element, three-phase meter has recently been developed by the Sangamo Electric Company, Springfield, Ill., for accurate metering on four-wire, three-phase circuits where both unbalanced voltages and currents are likely to exist. In addition to eliminating the need for three single-phase meters, which would otherwise have to be used for accurate metering under these conditions, the three-element meter is particularly useful where it is desired to obtain demand readings.

The meter has three single-phase meter elements placed one above the other, each element having its disk mounted on the common shaft, which thus records on the dial the total energy of a three-phase, four-wire system. Each element has an independent torque-balancing arrangement consisting of a return plate adjustable by small levers at the side of the grid. Another advantage of this new meter is that with very few exceptions all parts are interchangeable with the corresponding elements of Sangamo single-phase type H meters.

Electric Elevator "Tructor"

An electric elevator "tructor" for transporting and stacking bulky cylindrical and rectangular loads has just been developed by the Elwell-Parker Electric Company, Cleveland. The tructor handles rolls of fabric, steel, news print, barrels, boxes, etc. It automatically picks up its load in any position and stacks it either vertically or horizontally as desired. The lower end of the load can be raised by the elevator to an elevated position of 6 ft.

The unit consists of an elevator tructor with a revolving apron or cradle for securing the load at the end of the platform, the cradle being built to suit. The load is raised or lowered by operating the elevating platform while the cradle is revolved to any position by means of the additional hoisting unit. A central storage battery, carried in the battery compartment, is used with individual controllers for the lifting, revolving and driving mechanism. The standard Elwell-Parker safety devices are installed, including a device for instantly stopping the elevator motor if the elevating cable should slacken while lowering the load because of striking an obstruction. One man operates the equipment and has a clear vision of the forward part of the unit at all times.

Mercury-Motor Ampere-Hour Meter

A new line of ampere-hour meters, known as type N, has recently been placed on the market by the Sangamo Electric Company, Springfield, Ill. The type N is a simple form of mercury-motor meter, comprising a single copper disk rotating in a mercury chamber which is placed between the pole tips of two large permanent magnets. No separate damping disks or damping magnets are required, the one set of permanent magnets furnishing both the driving flux and the damping or retarding force. The only exposed moving parts are the shaft and a small counterweight. A moisture-proof steel case is provided for the meter.

The high torque obtained by the type N construction permits the meter to be built in small capacities and assures accuracy on very light loads without the use of a thermocouple or other compensating device. The simple meter, without resistor, is offered in capacities ranging from 25 amp. upward. The battery-control meter is furnished in capacities from 10 amp. up. These small-capacity meters are adapted to the measurement of loads varying from a fraction of an ampere to several times the rated capacity of the meter. The meter is furnished in various types.

Elevating Platform Truck

A special elevating platform truck, which has a height of 17½ in. from the floor when the platform is down and 22 in. when the platform is raised, has been placed on the market by the Crescent Truck Company, Lebanon, Pa. The rear wheels are 15 in. in diameter which gives 6 in. clearance underneath the platform. All the tires are 5 in. wide, and the truck has been constructed throughout for heavy service with a lifting capacity of 6,000 lb. The wheels are equipped with Timken roller bearings, the driving unit is carried on SKF ball bearings, the controller is built by the Cutler-Hammer Manufacturing Company and the motors are General Electric. All working parts are accessible and can be easily adjuted. The loading platform is 70 in. long and 26 in. wide.

Twist Drill Grinder.—An electrically driven 6-in. bench or pedestal grinder, which will quickly and accurately grind straight or taper-shank twist drills up to ⅝-in. diameter, has been placed on the market by the Black & Decker Manufacturing Company, Towson, Md. The twist drill is fed to the cup-grinding wheel by means of a micrometer screw feed. No adjustments are necessary for grinding different-size twist drills, this being compensated for in the design. The grinder can be operated from a lamp socket.

Telephone Diaphragm.—A telephone diaphragm made of a combination of iron filings and celoron, which is a fiber and bakelite compound, is being placed on the market by the Diamond State Fibre Company, Bridgeport, Pa. The diaphragm may also be used in phonographs, radio apparatus, etc. It is said to be more delicate than metal and has the peculiar property inherent in few substances in that it improves with age.

Adjustable-Pull Candle Socket.—A new adjustable-pull candle socket which will meet all requirements of 4-in., 5-in. or 6-in. candles and holders has been placed on the market by the Hart & Hegeman Manufacturing Company, Hartford, Conn. Four separate yokes are designed to be attached to the pull body so that any adjustment may be made. The various yokes are readily changed by loosening the two screws which attach it to the pull body.

Electric Hoist.—A new electric hoist, designated as type R and available in capacities from 500 lb. to 4,000 lb. (inclusive), has been recently added to the line of the Roeper Crane & Hoist Works, Inc., Reading, Pa. The hoist is worm-geared. The worm is placed above the gear to reduce wear, and the worm shaft is equipped with a ball end-thrust bearing. The motor is mounted directly upon an extension of the hoist frame. The main frame is a one-piece casting that contains all bearings so that shafts and moving parts are kept in alignment. An automatic stop is provided with top and bottom limits. Controllers are of the single-speed drum type, and push-button control can also be provided. The moving parts of the hoist are entirely inclosed and operate in a bath of heavy oil or grease.

New Trade Literature

ELECTRIC HOISTS.—The Shepard Electric Crane & Hoist Company, Montour Falls, N. Y., has issued a catalog covering the "Shepard" floor-operated electric hoists. It describes each type of hoist and contains illustrations showing various installations. It also gives clearance drawings and dimensions and complete information regarding capacities, heights of lifts, etc.

WATT-HOUR METERS.—An eight-page folder has been issued by the Sangamo Electric Company, Springfield, Ill., describing its type "H" watt-hour meter. The folder is in the shape of the watt-hour meter and is so arranged that each page shows the meter with some element removed, making clear the entire construction. Descriptive text is on the back of each sheet.

STEAM PURIFIERS. — The Andrews-Bradshaw Company, 530 Fourth Avenue, Pittsburgh, Pa., has issued a booklet containing a report of the A. C. Neilsen Company, Chicago, which made an investigation regarding the use of the "Tracy" steam purifiers in the power plant of the Central Illinois Light Company, Peoria, Ill., which is completely equipped with Tracy purifiers designed for a capacity of over 30,000 boiler-horsepower.

PYROMETER.—The Republic Flow Meters Company, 2240 Diversey Parkway, Chicago, is distributing a pamphlet showing in detail the new "Republic" indicating and graphic pyrometer.

ELECTRIC RANGES.—The A. J. Lindemann & Hoverson Company, Milwaukee, Wis., has issued a folder describing the "L & H" automatic time and temperature control electric ranges.

WALL RECEPTACLES AND CABLE CONNECTORS.—Catalog No. 53 issued by the Russell & Stoll Company, 53 Rose Street, New York City, describes and illustrates its various types of wall receptacles and several types of cable connectors.

GRAPHIC INSTRUMENTS.—The Esterline-Angus Company, Indianapolis, Ind., has issued a booklet entitled "Graphic Instruments in Industry," which describes the use of the "Esterline-Angus" instruments in the pulp and paper industry. It contains numerous illustrations and record charts applicable to any industry.

BLOWER AND SUCTION CLEANER.—The Martindale Electric Company, Box 35, Lakewood Branch, Cleveland, is distributing a folder describing its "Imperial Blow-er Clean," which is a combined blower and suction cleaner.

Foreign Trade Opportunities

Following are listed opportunities to enter foreign markets. Where the item is numbered, further information can be obtained from the Bureau of Foreign and Domestic Commerce, Washington, by mentioning the number.

Purchase and agency is desired in Bradford, England (No. 12,343), for household electric lighting plants and household electric refrigeration plants.

An agency is desired in Port Elizabeth, South Africa (No. 12,401), for electric household-lighting plants.

TENDERS ASKED FOR SWITCHBOARDS IN MONTEVIDEO, URUGUAY.—The Administracion General de las Usinas Electricas del Estado, Montevideo, Uruguay, will receive tenders until Dec. 29 for power switchboards. Copies of specifications and blueprints may be seen at the New York and Chicago district offices of the Bureau of Foreign and Domestic Commerce, Department of Commerce, by referring to file No. 150,318.

COPPER WIRE FOR MADRID, SPAIN. —Tenders, it is reported, are being asked by the Spanish Ministry of Communications, Madrid, Spain (no date given), for 60 tons of electrolytic wire, 3 mm. in. diameter, for the use of the telegraph and telephone service.

ELECTRIC GENERATORS, STEAM ENGINES, ETC., FOR SANTIAGO, CHILE. —Tenders, it is reported, are being asked by the Port of Constitucion, Santiago, Chile (no date given), for semi-portable steam engines, electric generators, etc., for Port Constitucion.

ELECTRICAL EQUIPMENT FOR THE YALLOURN POWER SCHEME, AUSTRALIA.—Tenders will be received by R. Liddelow, secretary of the State Electricity Commission of Victoria, Melbourne, Australia, until Dec. 20 for switchgear and accessories (specification No. 24/114). Tenders will also be received until Jan. 19, 1925, for voltage regulating apparatus (specification No. 25/2) and for 6,600-volt transformers and spares (No. 25/1). For details see Searchlight Section.

Construction News

Projects, Plans, Bids and Contracts, Contemplated or Under Way

New England States

EAST BRIDGEWATER, MASS. — The Department of Public Utilities has filed notice with the town clerk of the permission granted to the Edison Electric Illuminating Company of Brockton to erect additional high-tension lines here. The proposed lines will connect the local plant with the new Montauk station being built near Fall River.

WOBURN, MASS.—The Edison Electric Illuminating Company, Boston, will proceed with superstructure work on its proposed local substation, to be known as Substation No. 58. Bigelow & Wadsworth, 3 Hamilton Place, Boston, are architects.

Middle Atlantic States

BETHEL, N. Y. — The Public Service Commission has granted the New York State Gas & Electric Corporation, Ithaca, permission to construct and operate an electric distribution system in Bethel.

BINGHAMTON, N. Y.—The installation of an improved street-lighting system is under consideration by the City Council. The Binghamton Light, Heat & Power Company has offered to install ornamental lamps in any location suggested by the Mayor for demonstration purposes.

BUFFALO, N. Y.—Plans are being considered for the installation of a new lighting system on Main Street from Ohio to Carlton Street.

CICERO, N. Y.—A movement has been started to secure a street-lighting system for this community.

HERKIMER, N. Y.—A proposal to install an improved lighting system in the village has been approved by the lighting committee of the Chamber of Commerce and the Municipal Commission. The plans call for the erection of 133 pedestal lamps, to cost about $36,000.

MALTA, N. Y.—The Adirondack Power & Light Company, Schenectady, has applied to the Public Service Commission for permission to erect a transmission line in Malta under a franchise granted by the town. It proposes to erect a line through the northerly part of Malta to supply energy to towns north of here.

MEDINA, N. Y.—The City Council plans to install generators, etc., at the municipal pumping station, to replace machinery recently destroyed by fire.

UTICA, N. Y.—Petitions have been submitted to the City Council for electric lamps for Clinton Avenue, Elwood, Canal, Louisa and East Whitesboro Streets.

WATERTOWN, N. Y. — The Northern New York Utilities, Inc., has tentative plans under consideration for the construction of three hydro-electric plants on Beaver River, in the vicinity of High Falls, Sewell Island and Soft Maple. The cost is estimated at about $750,000.

RIDGEFIELD PARK, N. J.—Arrangements have been made with the Public Service Electric Company, Newark, whereby the street-lighting system throughout the entire town will be improved.

CONNELLSVILLE, PA. — The H. C. Frick Coke Company, Carnegie Building, Pittsburgh, has authorized the plans prepared for the complete electrification of seven of its mines, to cost about $2,000,000.

WARREN, PA.—The Penn Public Service Company, Johnstown, has acquired a site adjoining the West End power station, on which it plans to build a large addition during 1925.

WILLIAMSPORT, PA.—The installation of an ornamental lighting system in the business section is under consideration by the City Council.

WAR, W. VA.—The War Light & Water Company has applied for a franchise to install a local light and power system.

LYNCHBURG, VA.—Surveys are being made by the American Electric Power Company, which controls the Appalachian Power Company, Bluefield, W. Va., for the erection of a transmission line from Glen Lyn through Roanoke to Lynchburg to supply electricity here, which will be distributed by the Lynchburg Traction & Light Company. Electricity will be supplied by the Glen Lyn plant of the Appalachian company.

WASHINGTON, D. C.—Bids will be received by the Bureau of Supplies and Accounts, Navy Department, until Dec. 9, for a quantity of flashlights for Eastern and Western yards (Schedule 2968).

WASHINGTON, D. C.—Bids will be received at the office of the General Purchasing Officer, the Panama Canal, Washington, D. C., until Dec. 12, for rope, cable, insulators, worm gears, collets and attachments, transformers, storage batteries, signal and transformer oil, etc.

WASHINGTON, D. C.—Bids will soon be asked by the United States Engineer, Old Land Office Building, for motors, pumps and accessory equipment for the District of Columbia water supply project.

North Central States

BAY CITY, MICH. — Plans are under consideration by the city authorities for the installation of an ornamental lighting system.

DETROIT, MICH. — The Detroit Edison Company is considering the erection of a substation on Baubien Street.

MARCELLUS, MICH.—The Michigan Gas & Electric Company, Ishpeming, contemplates the erection of a transmission line for local commercial service.

MUSKEGON, MICH. — Bids are being asked by the Board of Education until Dec. 10 for the construction of a central power plant in connection with a proposed senior high school. The entire project will cost about $700,000. H. H. Turner and V. E. Thebaud, Michigan Trust Building, Grand Rapids, are architects, and W. W. Bradfield, Michigan Trust Building, Grand Rapids, is consulting engineer.

REED CITY, MICH.—Plans are under consideration for extensions and improvements in the municipal electric plant, to include the installation of a 200-hp. oil engine and other equipment, to cost about $19,000.

SAGINAW, MICH.—The City Council is considering the installation of electric lamps in all alleys and also extensions to the lighting system in different parts of the city.

CLEVELAND, OHIO.—Bids will be received at the office of the Commissioner of Purchases and Supplies, City Hall, until Dec. 12 for pole-type, constant-current regulators for the division of light and power. Bids will also be received at the same date and place for ornamental "white-way" standards.

MILLERSBURG, KY. — Bonds to the amount of $11,000 have been voted for the installation of an electric plant to furnish electricity for lighting and power purposes.

NEWCASTLE, IND.—Plans for the proposed local plant to be erected by the Circle A Products Company, Champagne, Ill., include a power house. The entire project will cost about $200,000. F. B. Berger and R. L. Kelly, Champagne, are architects.

CANTON, ILL. — The Central Illinois Public Service Corporation, Springfield, contemplates the construction of an ice plant in Canton, to cost about $50,000.

CEDARVILLE, ILL.—The Illinois Northern Utilities Company, Dixon, plans to erect a transmission line from Freeport to Cedarville, about 7 miles. Extensions will be made later to Winslow and Orangeville.

LITTLE YORK, ILL. — The Illinois Power & Light Company, Chicago, has been granted permission to purchase the local electric system, owned by S. Pardee. The company plans to erect a transmission line from Kirkwood to furnish service here.

WITT, ILL. — The City Council has granted Theodore C. Keller, president of the Keller Coal Company, Chicago, which operate large mines at Hillsboro, Taylor Springs, Nokomis and Witt, a franchise to furnish electricity here. A large power plant, it is stated, will be built in Witt to furnish energy to operate all the mines of the company in addition to lighting the city. Mr. Keller is reported to be negotiating for a similar contract at Wenonah.

MARINETTE, WIS.—The complete revision of the street-lighting system is under consideration by the City Council and the officials of the Menominee & Marinette Light & Traction Company, Menominee, Mich.

MILWAUKEE, WIS.—Plans have been announced by the North American Company, New York City, for development of public utilities owned or controlled by the company in Wisconsin during 1925, involving an expenditure of about $10,000,000. Included in the work is the erection of a high-tension transmission line extending practically the entire length of the state. It will connect the new Lakeside power plant of the Milwaukee Electric Railway & Light Company in Milwaukee with four other power stations on the Menominee River along the northern boundary. The important improvements contemplated in connection with the Peninsular Power Company, Madison, recently acquired by the North American Company, are not included in the above. The superpower plant provides for the further extension of the transmission line, which now extends as far as Plymouth, and its ultimate connection with the hydro-electric plants of the Peninsular Power Company.

SUPERIOR, WIS.—The City Council is considering the installation of an ornamental lighting system in the vicinity of Twentieth and Twenty-fifth Avenues, East.

SCANLON, MINN. — The Minnesota Power & Light Company, Duluth, has authorized the erection of a transmission line to Esko's Corner.

DUBUQUE, IOWA. — The Interstate Power Company, Decorah, is perfecting plans for the erection of a transmission line in this section, to connect with a station recently acquired.

FORT DODGE, IOWA.—The installation of an improved fire-alarm system is under consideration by the City Council.

AURORA, MO.—The Beth Chemical Corporation, care of T. H. Loy, secretary Chamber of Commerce, plans to build a power house at its proposed local plant for which a site has been acquired.

BOLIVAR, MO.—The Ozark tilities Company, recently organized, is reported to be planning to erect a transmission line. L. K. and L. R. Green, Pleasant Hill, head the company.

FULTON, MO. — Preliminary plans are being prepared by the board of managers of the State Eleemosynary Institutions, Jefferson City, for a power plant for the local State Hospital for Insane and Deaf and Dumb School, to cost about $150,000.

HORNERSVILLE, MO. — The Public Service Company of Missouri, Columbia, has secured a local franchise and plans to install a light and power system. Extensions will be made in transmission lines.

ST. JOSEPH, MO.—A special election will be held on Dec. 16 to vote on the proposal to issue $300,000 in bonds, the proceeds to be used for a new municipal light and power plant.

CARTHAGE, S. D.—The local electric plant, owned by L. W. Liddle, has been purchased by the McGraw Company, 515 Fifth Avenue, Sioux City, Iowa. The McGraw company is erecting a high-tension transmission line from Fedora to Carthage to connect with the local system.

CENTERVILLE, S. D.—The installation of an electric lighting system in part of the town, to cost about $9,000, is under consideration by the Town Council.

MITCHELL, S. D. — The Northwestern Public Service Company, Armour, is planning to erect a transmission system in this district, connecting a number of power plants recently acquired. The cost is estimated at about $1,750,000.

MITCHELL, NEB. — The Town Council has decided to extend the present lighting system to cover seven blocks. More than fifty new lamps will be erected.

Southern States

SALUDA, S. C.—The Saluda Public Service Corporation is planning to erect a 33,000-volt transmission line from Saluda to Batesburg, a distance of about 15 miles. The plans include a local substation.

JACKSONVILLE, FLA. — The installation of an ornamental lighting system on Atlantic Avenue, to cost about $25,000, is under consideration.

PALATKA, FLA. — Preliminary plans are under consideration for the installation of an ornamental lighting system in the business district.

ST. MARKS, FLA.—Plans for the proposed lumber mill to be erected by the Henry-Hays Lumber Company, Inc., Mobile, Ala., include a power house. The cost of the entire project is estimated at $100,000.

CHATTANOOGA, TENN.—The Southern Railway Company, Washington, D. C., plans to install electric power equipment in connection with the proposed rebuilding of its local car and locomotive shops, to cost about $650,000.

JONESBORO, ARK. — The Jonesboro Cotton Mills, Inc., recently formed with a capital of $600,000, plans to install electric power plant at its proposed local mill. The cost is estimated at $350,000. R. C. Biberstein, Charlotte, N. C., is architect and engineer.

LAKE CHARLES, LA. — The Eastern Texas Electric Company, Beaumont, Tex., is considering an issue of $1,000,000 in capital stock, the proceeds to be used in connection with the purchase of the properties of Lake Charles (La.) Electric Company and the Port Arthur (Tex.) Ice & Refrigerating Company, and for proposed extensions and improvements.

NEW ORLEANS, LA. — Plans for the proposed cement mill and lime-manufacturing plant to be erected by the Phoenix Portland Cement Company, Jefferson County Bank Building, Birmingham, Ala., on the new industrial canal, to cost about $1,750,000, include a power house.

SHREVEPORT, LA. — Work will soon begin on the construction of a new electric generating station for the Southwestern Gas & Electric Company. The new station will be located on Pierre Avenue at the junction of Cross Bayou and will supplement the present plant at the foot of Edwards Street. The initial installation will have a capacity of 10,000 kw., with provision for an ultimate capacity of 50,000 kw. The first unit will cost about $1,250,000. The total cost is estimated from $2,500,000 to $3,000,000.

CLINTON, OKLA.—Work has started on the rebuilding of the local electric plant, recently acquired by the Oklahoma Gas & Electric Company, Oklahoma City. The output of the plant will be increased 1,200 hp.

SHAWNEE, OKLA.—The Chicago, Rock Island & Gulf Railroad Company, El Reno, is considering the construction of a power house at its local car shops.

COLEMAN, TEX.—Bonds to the amount of $105,000 have been voted for improvements to waterworks, including additional mains, increasing pumping capacity, enlarging power house, etc.

RAYMONDVILLE, TEX.—The property of the Raymondville Light, Power, Water & Ice Company is reported to have been acquired by the Valley Electric & Ice Company, San Antonio, which plans to erect a storage plant.

SAN BENITO, TEX.—The Valley Electric & Ice Company is planning to erect a high-tension transmission line from here to Matamoros, Mexico, a distance of about 27 miles, to furnish electricity for commercial and industrial purposes. The company also plans to extend its transmission lines from Harlingen to Raymondville.

Pacific and Mountain States

BELLINGHAM, WASH.—Plans for the proposed mill to be erected near here by the Utah-Idaho Sugar Company, Salt Lake City, Utah, at a cost of about $1,000,000, include a power house.

DRYDEN, WASH. — The Puget Sound Power & Light Company, Seattle, contemplates enlarging its local generating plant, increasing the output from 1,600 hp. to 3,100 hp. The cost is estimated at $75,000 and will include extension to present power house, increasing capacity of canal, building concrete spillway, new penstock and installation of additional generating equipment.

OROVILLE, WASH. — A franchise has been granted to D. J. Broderick and Eugene Hockett to erect and maintain an electric lighting, heating and power system in Oroville. The project includes the construction of a dam on the Similkameen River to develop power.

SEATTLE, WASH. — The Puget Sound Power & Light Company has applied to the County Commissioners for franchises permitting it to erect transmission lines through more than 100 townships in the county.

TACOMA, WASH.—The installation of ornamental lamps on Commerce Street between Seventh Street and Jefferson Avenue is under consideration by the City Council. A resolution authorizing ornamental lamps on Cushman Avenue between South Sixteenth and Twenty-eighth Streets has been adopted by the Council. The construction of underground conduits and removal of poles on Cushman Street, the cost of which is estimated at $460,000, is being agitated.

WENATCHEE, WASH.—The Puget Sound Power & Light Company, Seattle, plans to increase the output of its local power station from 2,000 hp. to 4,000 hp.

WOODLAWN, WASH.—The Town Council has awarded a contract to the Puget Sound Power & Light Company, Seattle, for city lighting for a period of ten years.

EUGENE, ORE.—The construction budget of the City Light Department for 1925 provides $42,000 for extensions and improvements in the municipal light and power plant and $50,000 for line extensions.

SCIO, ORE.—At a special election held recently the proposal to sell the municipal electric plant and distributing system to the Mountain States Power Company, Albany, was carried. The company, it is understood, will erect a transmission line to the city to connect the local system with its Willamette division.

LOS ANGELES, CAL.—The Department of Public Service has filed plans for extensions and improvements in the substation at 211 Power Street, to cost about $25,000.

LOS ANGELES, CAL.—The directors of the Southern California Edison Company have authorized $25,000,000 for the construction budget for 1925. The new budget provides for the following work: Hydro-electric development on Big Creek, San Joaquin projects, $7,535,000; completion of steam plants now under construction, $3,965,000; increasing 220-kv. transmission facilities, $1,500,000; extension of distribution system and improvements, $12,000,000.

LOS ANGELES, CAL.—The City Council has authorized the installation of ornamental lamps as follows: On Sixth Street, 106 cast-iron standards; Highland Avenue, forty concrete standards; Norton Avenue, twenty-six concrete standards; New Hampshire Avenue, seventeen concrete standards; Sierra Bonita, Curson and Stanley Avenues, and Gardner Street, fifty-five concrete standards.

LOS ANGELES, CAL.—Plans have been authorized for the installation of ornamental lamps as follows: On Beverly Boulevard, eighty-six pressed-steel standards; Western and Santa Barbara Avenues, ninety-two pressed-steel standards; Western Avenue, forty-three pressed-steel standards; Windsor Boulevard, fifteen concrete standards; McCadden Place, forty-one concrete standards; Homewood and Kingston Avenues, twenty-six concrete standards, and Sixteenth and Third Streets, 124 concrete standards. The cost is estimated at about $100,000.

ORANGE, CAL.—Plans have been authorized for the installation of an ornamental street-lighting system on Chapman Avenue, for which bids will be asked at an early date.

SAN FRANCISCO, CAL. — Magner Brothers, 114 Ninth Street, plan to install electric power equipment in their proposed plant to be erected on Napoleon Street, to cost about $200,000.

PLEVNA, MONT.—At an election held recently bonds were authorized for the purchase and installation of a municipal electric light plant.

DEMING, N. M.—Plans are being prepared for a secondary dam and reservoir in connection with a proposed hydro-electric power development at the Elephant Butte dam. J. W. Taylor, president of the Elephant Butte Irrigation District, is interested in the project.

Canada

VICTORIA, B. C.—The Canadian Western Cooperage Company plans to install electric power equipment at its proposed local plant, to cost about $135,000.

CHESTER, N. S.—Plans are under way by the Chester Light & Power Company, recently organized, for the construction of an electric lighting plant in Chester.

FORT WILLIAM, ONT.—The installation of an improved lighting system has been recommended to the City Council by the fire, water and light committee.

FORT WILLIAM, ONT.—Plans are under way by the Great Lakes Paper Company for an addition to its plant next spring, to cost from $2,500,000 to $4,000,000. It is proposed to increase the power supply from 7,500 hp. to 20,000 hp.

IROQUOIS FALLS, ONT. — Plans are being considered by the Abitibi Power & Paper Company for an addition to its plant, to cost about $3,000,000. G. F. Hardy, 309 Broadway, New York City, is consulting engineer.

Electrical Patents

Announced by U. S. Patent Office

(Issued November 11, 1924)

1,514,725. AUTOMATIC TELEPHONE SYSTEM; W. T. Powell, Chicago, Ill. App. filed Nov. 8, 1915.

1,514,732. ELECTROMAGNETIC SIGNALING APPARATUS; P. J. Ruddy, Centralia, Pa. App. filed June 21, 1921. Can be used without aërial or ground wires.

1,514,733. CONDENSER; A. H. Sass, Mount Vernon, N. Y. App. filed May 11, 1922. Radio type.

1,514,735. METHOD OF AND MEANS FOR PRODUCING HARMONICS OF ALTERNATING CURRENTS; Edward O. Scriven, New York, N. Y. App. filed July 16, 1918. Produced by a distorting repeater.

1,514,736. ASYMMETRIC-CELL ANODE; H. O. Siegmund, Springfield, N. J. App. filed May 11, 1921. For electrolytic condensers.

1,514,746. MUSCLE-STIMULATING ELECTRIC DEVICE; Reinhold H. Wappler, Yonkers, N. Y. App. filed Nov. 29, 1922.

1,514,751. VACUUM-TUBE OSCILLATOR CHRONOMETER; Peter I. Wold, East Orange, N. J. App. filed Aug. 24, 1920.

1,514,752. METHOD OF AND MEANS FOR RECEIVING RADIO SIGNALS; Peter I. Wold, East Orange, N. J. App. filed Sept. 14, 1920.

1,514,753. SIGNAL-RECEIVING SYSTEM; Peter I. Wold, Schenectady, N. Y. App. filed Nov. 19, 1920.

1,514,792. SELECTOR; Albert H. Reiber, Bronx, N. Y. App. filed Sept. 2, 1922. For printing telegraph system.

1,514,793. ELECTROPLATING MACHINE; Hedley J. Richards, St. Louis, Mo. App. filed May 26, 1924. Motion type.

1,514,800. AUTOMATIC SWITCH; Michael Skender, Pittsburgh, Pa. App. filed Sept. 7, 1923. Automatic limit and reversing switches, as adapted to prevent the overrunning of hoisting cranes, etc.

1,514,813. ELECTRIC HEATING DEVICE; Leslie M. Adams, Seattle, Wash. App. filed May 31, 1922. Fluid heater.

1,514,837. MACHINE-SWITCHING TELEPHONE SYSTEM; Gerald Deakin, London, England. App. filed Nov. 23, 1918.

1,514,844. SWITCHING SYSTEM; Joseph C. Field, Orange, N. J. App. filed July 5, 1919. Employed in connection with the detection of the presence of submarine or other marine vessels.

1,514,847. TELEPHONE-EXCHANGE SYSTEM; Clarence B. Fowler, New York, N. Y. App. filed Dec. 4, 1919.

1,514,850. CO-ORDINATE SWITCH; Harold W. Goff, New York, N. Y. App. filed April 13, 1922. Adapted for establishing connections in an automatic telephone-exchange system.

1,514,854. SWITCHING SYSTEM; John B. Harlow, Upper Montclair, N. J. App. filed July 5, 1919. Employed in detecting the presence of marine or submarine vessels.

1,514,857. FIRE BAR FOR ELECTRIC WATER HEATERS; Robert H. MacInnes, Hamilton, Ontario, Canada. App. filed July 27, 1923. Resistance-wire support for heaters of the household type.

1,514,858. HINGED OVEN BURNER; Robert H. MacInnes, Hamilton, Ontario, Canada. App. filed July 27, 1923.

1,514,861. TELEPHONE-EXCHANGE SYSTEM; Arthur Raynsford, New York, N. Y. App. filed Dec. 27, 1919.

1,514,881. AUTOMATIC REVERSING CONTROL; George S. Van Norman, Detroit, Mich. App. filed Nov. 20, 1920. Adapted to drive reciprocating machines, such as planers, rockable electric furnaces, etc.

1,514,897. COMBINED RADIOPHONE AND PHONOGRAPH; Robert G. French, Chicago, Ill. App. filed April 17, 1922.

1,514,898. THERMIONIC DEVICE; George L. Geisey, Steubenville, Ohio. App. filed July 18, 1923. Vacuum tube.

1,514,904. CONTACT FINGER; Arthur G. Henricks, Milwaukee, Wis. App. filed March 18, 1921. For controllers.

1,514,905. SWITCH CONSTRUCTION; William F. Hessel, New York, N. Y. App. filed Feb. 15, 1919. Multiple-tap switch device.

1,514,918. ELECTRIC FURNACE; Charles Miller, Bridgeport, Conn. App. filed Nov. 3, 1922. For operation at high temperatures.

1,514,950. ELECTRICAL LAUNDRY IRON; Michael Brown, Brooklyn, N. Y. App. filed Aug. 22, 1923.

1,515,032. ELECTRIC SWITCH; Talma T. Greenwood, Templeton, Mass. App. filed Oct. 29, 1920. High-capacity oil switch.

1,515,042. ELECTROLYTE AND COMPOSITION FOR FORMING THE SAME; August Heck, Philadelphia, Pa. App. filed Aug. 22, 1923. Used in electrodeposition of metals.

1,515,072. THERMAL CIRCUIT CLOSER; George O. Ruff, Paris, Ill. App. filed Sept. 11, 1922. Having a vertically movable float which automatically closes an electric circuit.

1,515,074. LIGHTNING ARRESTER; Joseph A. Schermerhorn, Trenton, N. J. App. filed Aug. 17, 1922. For radio installations.

1,515,076. ELECTRICALLY DRIVEN WHEEL FOR MOTOR VEHICLES; J. Schurch, Los Angeles, Cal. App. filed July 31, 1922.

1,515,092. PROCESS AND APPARATUS FOR COATING WIRE AND OTHER DRAWN AND ROLLED SECTIONS WITH OTHER METALS; S. O. Copwer-Coles, Sunbury-on-Thames, England. App. filed Jan. 2, 1924.

1,515,109. CURRENT-MODIFYING RELAY SYSTEM; Ralph V. L. Hartley, East Orange, N. J. App. filed Sept. 23, 1919. As used in wave-distorting repeating devices.

1,515,115. STORAGE-BATTERY CONTAINER; Sidney Isaacson, New York, N. Y. App. filed April 13, 1922.

1,515,116. SWITCH; Ernest H. Jacobs, Chicago, Ill. App. filed April 14, 1919. Disconnecting.

1,515,118. FIXTURE; William L. Johns, Cleveland, Ohio. App. filed Feb. 6, 1922. Lamp socket adjustable longitudinally.

1,515,128. ELECTRODE FOR ELECTROLYTIC CONDENSERS; Ralph E. Marbury, Wilkinsburg, Pa. App. filed Oct. 27, 1920. Formed of corrugated or folded sheet metal, as in lightning arresters, rectifiers, etc.

1,515,138. CONTROL SYSTEM; Louis M. Aspinwall, Pittsburgh, Pa. App. filed Feb. 3, 1923. In which electromagnetic switches are operated by line voltage.

1,515,143. CONTROL APPARATUS; Andrew H. Candee, Pittsburgh, Pa. App. filed Aug. 5, 1919. Contactors of the electropneumatic type.

1,515,147. ELECTRIC SIGNAL DEVICE; Jay W. Clark, New York, N. Y. App. filed April 27, 1920. Buzzers, annunciators, etc.

1,515,152. COMMUNICATION SYSTEM FOR RAILWAY TRAINS; Lee De Forest, Spuyten Duyvil, New York. App. filed Dec. 10, 1919. Effected electropneumatically between points on the train.

1,515,166. ELECTRICAL SYSTEM; Harvey S. Pardee, Chicago, Ill. App. filed April 20, 1916. Farm-lighting-plant type.

1,515,176. AUTOMATIC ELECTRIC CIGAR LIGHTER; Solomon D. Sacks, New York, N. Y. App. filed March 24, 1924.

1,515,183. CIRCUIT BREAKER; Pieter G. Van Wijk, Geldermalsen, Netherlands. App. filed Oct. 17, 1922. Miniature automatic type.

1,515,186. APERIODIC RECEIVER SYSTEM; Frank Conrad, Pittsburgh, Pa. App. filed June 3, 1920. Wireless telegraphic system.

1,515,191. MOTOR-CONTROL SYSTEM; Ray E. De Camp, Wilkinsburg, Pa. App. filed Nov. 3, 1919. For preventing or controlling the restarting of electric motors the armatures of which are rotating above a predetermined speed.

1,515,193. INSULATOR CONNECTER; George M. Eaton, Pittsburgh, Pa. App. filed Sept. 13, 1919. For series-related strain and suspension insulator sets.

1,515,197. ELECTRICAL PROTECTIVE DEVICE; Adolph A. Gazda, Wilkinsburg, Pa. App. filed Dec. 13, 1917. Reverse-phase tripping device.

1,515,199. TEMPERATURE REGULATOR; Howard A. Hands, Swissvale, Pa. App. filed June 10, 1922. Circuit-controlling device of the fluid circuit-interrupting type.

1,515,200. BALANCED PHASE CONVERTER WITH POWER-FACTOR CORRECTION; Rudolf E. Hellmund, Swissvale, Pa. App. filed Jan. 6, 1921. Using a transformer and an induction-type phase converter.

1,515,202. AUTOMATIC FLATIRON CONTROLLER; Harris D. Hineline, Wilkinsburg, Pa. App. filed Sept. 16, 1921.

1,515,205. MOTOR-CONTROL SYSTEM; George W. Huey, Wilkinsburg, Pa. App. filed Oct. 17, 1918. Using pilot motors for controlling operation of industrial motors.

1,515,206. RELAY AND CASING THEREFOR; George W. Huey, Wilkinsburg, Pa. App. filed Nov. 12, 1920. Rendered inoperative when the casing is removed.

1,515,208. CONTROL APPARATUS; Howard H. Johnston, Edgewood Park, Pa. App. filed Feb. 13, 1920. Drum controller.

1,515,215. MOTOR-CONTROL SYSTEM; George E. King, Wilkinsburg, Pa. App. filed Feb. 8, 1923. For the protection of and for controlling the speed of electric motors.

1,515,224. ELECTRIC SWITCH; Ira R. Seltzer, Waterbury, Conn. App. filed March 10, 1922. Of the push-through type, consisting of a plurality of complete switch units in series and electrically interconnected but independently operable.

1,515,227. SPEED-REGULATOR SYSTEM; Stephen A. Staege, Pittsburgh, Pa. App. filed Feb. 14, 1921. To maintain a substantially constant-speed ratio between a plurality of moving members.

1,515,231. ELECTRIC HEATING UNIT; Ernest E. Sutherland, Mansfield, Ohio. App. filed Jan. 25, 1924. Open type.

1,515,232. AUTOMATIC PLUG REVERSE SWITCH; George H. Whittingham, Baltimore, Md. App. filed Jan. 26, 1924. As used in wound-rotor induction motors.

1,515,234. EXHAUST VALVE FOR ELECTRICALLY HEATED OVENS; James C. Woodson, Mansfield, Ohio. App. filed March 14, 1921. Of the ventilated type.

1,515,260. AUTOMATIC STATION SWITCHING; Stuart G. Leonard, Galion, Ohio. App. filed Oct. 6, 1922. Controlling the operation of automatic substations.

1,515,261. ELECTRIC HEATING APPARATUS; John Lightfoot, Manchester, England. App. filed Jan. 15, 1924. As used in electric stoves, etc.

1,515,279. STORAGE BATTERY; Junjiro, Sato, Detroit, Mich. App. filed May 11, 1923. Lead type.

1,515,288. MAGNETIC CHUCK; Howard E. Tracy, Worcester, Mass. App. filed March 4, 1922.

1,515,292. MACHINE FOR BANDING ARMATURES; Robert J. White, Wilkinsburg, Pa. App. filed Sept. 16, 1922.

1,515,293 CORONA PROTECTION DEVICE; John B. Whitehead, Baltimore, Md. App. filed March 1, 1922. Means for protecting high-tension alternating-current cables from abnormal voltages.

1,515,308. ELECTRIC HEATING DEVICE; Henry C. Maul, Detroit, Mich. App. filed March 19, 1923. For stoves, etc.

1,515,309. WIRE-WINDING MACHINE; William O. Meissner, Chicago, Ill. App. filed Aug. 10, 1922. For winding bobbins.

1,515,321, 1,515,322. CONTROLLING SYSTEM FOR ELECTROMAGNETIC TRANSMISSION MECHANISM; Charles E. F. Ahlm, Cleveland Heights, Ohio. App. filed Aug. 24, 1921. As applied to automobiles to replace gear shifting.

1,515,324. ELECTRICAL DISTRIBUTION; Harry S. Arnold, Brooklyn, N. Y., and Ray C. Wilson, New York, N. Y. App. filed Dec. 29, 1923. For buildings.

1,515,331. RADIO-TRANSMISSION SYSTEM; Joseph Bethenod, Paris, France. App. filed Aug. 2, 1921.

1,515,345. TELEPHONE SYSTEM; Leroy D. Kellogg, Chicago, Ill. App. filed January 4, 1919. Automatic.

1,515,348. ELECTRODE; Isaac H. Levin, New York, N. Y. App. filed Sept. 24, 1921. Anode for use in electrolytic cells for the generation of oxygen and hydrogen.

1,515,354. ELECTRICAL SYSTEM; Lindsay H. Miller, Chicago, Ill. App. filed Aug. 19, 1916. Farm-lighting-plant type.

1,515,360. AUTOMATIC TELEPHONE REPEATER SYSTEM; Winfred T. Powell, Rochester, N. Y. App. filed June 14, 1919.

1,515,361, 1,515,362. AUTOMATIC TELEPHONE SYSTEM; Winfred T. Powell, Rochester, N. Y. App. filed Sept. 6, 1919.

1,515,370. MECHANICAL TELEPHONE SWITCHING SYSTEM; Frank M. Slough, Elyria, Ohio. App. filed May 17, 1919.

1,515,433. STATION INDICATOR; Edward H. Georgia, Waterbury, Conn. App. filed Feb. 5, 1924. For use on railway cars.

1,515,478. INDUCTION MOTOR; John B. Gury, Jr., and Robert H. E. Schlecht, St. Louis, Mo. App. filed Feb. 4, 1921. Control of the starting coils of single-phase motors.

1,515,492. REGULATING DEVICE FOR ELECTRIC FURNACES; James Kelleher, Goderich, Ontario, Canada. App. filed Oct. 16, 1919. Of the arc type.

1,515,500. RECHARGING DEVICE FOR MAGNETOS; Charles A. Lee, Rochester, N. Y. App. filed Sept. 9, 1920.

1,515,511. ELECTRICALLY HEATED FURNACE OR LEER; Edwin E. Milner, Scott Township, Allegheny County, Pa. App. filed Feb. 1, 1922.

1,515,535. ELECTRIC SWITCH; Chester D. Ainsworth, Wollaston, Mass. App. filed March 28, 1921. Oil circuit breaker.

1,515,547. ELECTRIC FISH STOP; Henry T. Burkey, Tulsa, Okla. App. filed March 29, 1922. For hydraulic plants.

1,515,578. ELECTRICAL SWITCH; Albert Glaser, New Orleans, La. App. filed Jan. 26, 1922. For radio use to perform the function of a jack and plug.

1,515,579. AUTOMATIC SWITCHING SYSTEM; Charles A. Butcher, East Pittsburgh, Pa. App. filed Aug. 28, 1922. For controlling the starting of a synchronous converter and the development of a predetermined polarity at the direct-current end.

(Issued November 18, 1924)

15,951 (reissue). ELECTRICAL TRANSFORMER SYSTEM; Friedrich Dessauer, Frankfort-on-the-Main, Germany. App. filed March 21, 1923. High-tension.

Financial and Corporate

Utility Market Picks Up

Several of the Leading Issues Establish Fresh High Prices as Trading Turns Livelier

EACH week since election the market in listed and unlisted power and light stocks has shown some improvement, but not until the past week did utilities develop general strength comparable to that in other groups. Attention appears to be swinging again to the utility list, and some of the more interesting recent developments have come there. North American Company's common stock, which had sold earlier in the year at 22, again pressed forward for new high ground well in the forties. Two other listed utilities among those actively dealt in got to the best levels in their history. American Water Works & Electric crossed 140, whereas the new stock, listed this week on the New York Stock Exchange, sold up to 28¼. Public Service Corporation of New Jersey sold above 68 at a new high price.

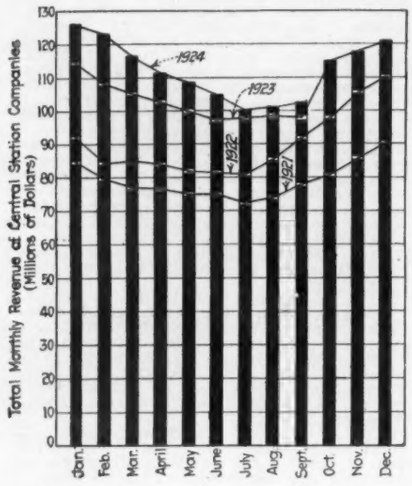
Among the unlisted stocks the issues of companies affiliated with the Electric Bond & Share Company showed greatest strength. American Gas & Electric by selling up about nine points under wide accumulation got to the highest price ever recorded for the present stock on talk of an increased dividend. American Power & Light Company's new stock suddenly turned strong toward the close of the week and sold as high as 56¾, at which it was up nine points for the week. Lehigh Power Securities improved and National Power & Light rose seventeen points.

The sharp rise in Power Securities on rumors that apparently had no foundation, and which were not confirmed by the Electric Bond & Share Company, was followed by a quick setback. The rise in another low-priced issue, Electric Railway Securities, was sustained. A better market was evident for such stocks as Middle West Utilities, Commonwealth Power and Tennessee Electric Power.

September Revenue 7.2 per Cent Above Last Year

Reports received by the ELECTRICAL WORLD from central-station companies representing approximately 75 per cent of the generator rating of the country indicate that the total gross revenue from the sale of energy during September totaled $103,200,000, or a daily average of $3,440,000, an increase of 7.2 per cent over September of last year.

Following the usual seasonal trend the revenue during the month of September was a material increase over that reported for August, but the revenue was still 1.2 per cent below the ELECTRICAL WORLD'S estimated normal revenue for the month. This is the third continuous month during which the revenue has been below the estimated normal.



GROSS REVENUE CONTINUES TO GAIN

Every section of the country reported revenue above last year. This is the first month since June during which the New England States have reported a revenue over 1923. The operating expenses during September totaled $49,300,000 and the operating ratio of systems having steam-electric plants only was 50.1 per cent as against 52.0 per cent in September last year.

Dividends Declared

The following quarterly dividends were announced by central-station companies and electrical manufacturing companies during the past week:

Name of Company	Per Cent	When Payable
Baton Rouge Electric, com.*	$5	Dec. 1
Baton Rouge Electric, pf.*	$3	Dec. 1
Central Illinois Public Service, pf.	$1.50	Jan. 15
General Gas & Electric, cum. pf., B†	$49	Dec. 5
General Gas & Electric, cum. pf., B.	$1.75	Jan. 2
General Gas & Electric, cum. pf. A.	$2	Jan. 2
Montana Power, com.	‡	Jan. 2
Montana Power, pf.	1¾	Jan. 2
Niagara Falls Power, com.	50c	Dec. 15
Niagara Falls Power, pf.	43¾c	Jan. 15
North American, com.‡	2½	Jan. 2
North American, pf.	1¾	Jan. 2
Northwestern Public Service, pf.	1¾	Dec. 1
Ohio-Edison, pf., 6%	$1.50	Mar. 1
Ohio-Edison, pf., 6.6%	$1.65	Mar. 1
Ohio-Edison, pf., 7%	$1.75	Mar. 1
Pacific Lighting, com., (in stock)	80	Dec. 22
Penn Central Light & Power, com.	37½c	Jan. 2
Penn Central Lt. & Pwr, com. (ex.)	10c	Jan. 2
Penn Central Light & Power, pf.	$1	Jan. 2
Penn Central Lt. & Pwr., pf. (ex.)	10c	Jan. 2
Pennsylvania Water & Power	2	Jan. 2
Southern Colorado Power, pf.	1¾	Dec. 15
Chicago Fuse Mfg.	62½c	Jan. 1
General Electric, capital	2	Jan. 15
General Electric, special	15c	Jan. 15
Worthington Pump & Mach., pf. A.	4¾	Jan. 2
Worthington Pump & Mach., pf., B.	1¾	Jan. 2

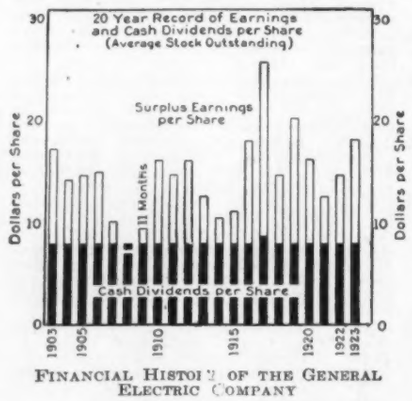
*Semi-annual. †Accrued dividends. ‡Payable in common stock at rate of one-fortieth of one share for each share held, or in cash at rate of 85 cents a share.

General Electric's Great Growth

This Leading Electrical Manufacturer Has Accumulated Surplus of $83,000,000, Although, Carrying Patents at a Dollar, It Has Written Off Millions

BY PAUL WILLARD GARRETT

PERHAPS no individual organization has profited more from the growth of the electric light and power industry than the General Electric Company, which, strictly speaking, is no utility. General Electric from the beginning has concerned itself with all phases of electrical development, but its principal business has been the manufacture of equipment. During periods when other industrial enterprises were suffering from depression the General Electric, through relations with the power and light industry, has gone ahead until to-day it is one of the country's leading business institutions.



FINANCIAL HISTORY OF THE GENERAL ELECTRIC COMPANY

An itemization of General Electric manufactures would include almost everything electrical from the smallest appliance to the huge turbines of modern construction. In thirty-two years the company's annual orders have increased from $12,000,000 to $304,199,746. While growth in the volume of business has been especially large during the last ten years, there has been a persistent increase throughout the company's history. The order figure given above is for 1923 and is 25 per cent larger than that for 1922. Orders for the first nine months of 1924 aggregated $203,097,719, a figure about 12 per cent smaller than for corresponding months a year ago.

An examination of the General Electric's balance sheet does not reveal all or nearly all of the enormous assets that lie back of the securities. The accounts show nothing for such intangibles as good will. General Electric has hundreds of immensely valu-

Stock and Bond Quotations of Electric Light and Power and Manufacturing Companies

(Prices on New York stock market unless otherwise noted. Unless otherwise noted the par, stated, or preference value of stocks is $100.

Companies	Bid Price Saturday, Nov. 29	Low 1924	High 1924
PREFERRED STOCKS			
Operating Companies			
Adirondack Power & Light 7 per cent	a 97½	94	97½
Appalachian Power, 7 per cent	a 90	85½	90
Arkansas Light & Power 7 per cent	a 93	81	96
Asheville Power & Light 7 per cent	a 96	96	99
Central Illinois Public Service 6 per cent	a 85	84	88
Colorado Power 7 per cent	a 92	90	98
Connecticut Light & Power 7 per cent	a105	99	106
Consumers' Power 6 per cent	a 90	85	93
Dayton Power & Light 6 per cent	a 88	84	93
Duquesne Light 7 per cent	a105½	102	108½
Eastern Texas Electric 6 per cent	a100	81	105
Empire District Electric 6 per cent	a 73	70	78
Fort Worth Power & Light 7 per cent	a 99	97	103
Great Western Power 7 per cent	98	96	99
Illinois Northern Utilities 6 per cent	85½	84	87
Illinois Power & Light 7 per cent	a 92	84	95
Kansas Gas & Electric 7 per cent	a 96	92	97
Long Island Lighting 7 per cent	98½	95½	102
Minnesota Power & Light 6 per cent	90	78	90
Mississippi River Power 6 per cent	a 88	80	90
Nebraska Power 7 per cent	96	89	99
Niagara, Lockport & Ont. Power 7 per cent	a102	99	107
Northern States Power 7 per cent	a 96	91	97
Ohio Public Service 7 per cent	a 93	86	100
Pacific Gas & Electric 6 per cent	a 91	85	93
Penn-Ohio Power & Light 7 per cent	90	84	96½
Pennsylvania Power & Light $7—no par	99½	93	99½
Penn. Public Service 7 per cent	a 90	90	100
‡Philadelphia Electric 8 per cent—25	a 38	29½	39½
Southern California Edison 8 per cent	a115½	112	120
Tennessee Electric Power, 6 per cent	a 71	47	71
Texas Power & Light 7 per cent	97	95	97½
Utah Power & Light 7 per cent	96	94	96½
Western States Gas & Electric 7 per cent	a 82½	78	86
Yadkin River Power, 7 per cent	99	94	99
Holding Companies			
American Gas & Electric 6 per cent—50	a 45½	41½	46
American Light & Traction	a 94½	91	94½
American Power & Light 6 per cent	a 89½	84	91
American Public Service 7 per cent	a 90	84	95
American Public Utilities 7 per cent	a 88	73	88
American Water Works & Electric 7 per cent	a 97½	89½	99
Associated Gas & Electric 7 per cent—1 per cent extra—50	a 48	42	52
Carolina Power & Light 7 per cent	a 99	95½	101
Central Indiana Power 7 per cent	a 88	80	93
Cities Service 6 per cent	a 81	67	83
Commonwealth Power 6 per cent	a 82½	72	82
Consolidated Gas 6 per cent—50	a 57½	51	59½
Continental Gas & Electric 7 per cent pr. pf.	a 90	69	93
Electric Bond & Share 6 per cent	a102	96½	104
General Gas & Electric—$8—no par	a105	96	105
*Middle West Utilities 7 per cent	a 92	80	92
National Power & Light—$7—no par	a 93½	84	96½
North American 6 per cent—50	a 48	43½	50½
Northern Ohio Electric	a 28	16	34
Public Service Corp. of N. J. 7 per cent	a100	94½	101½
Public Service Corp. of N. J. 8 per cent	a110½	99½	110½
Standard Gas & Electric 8 per cent—50	a 49	46½	49½
‡United Gas Improvement—50	58	55½	58
United Light & Power—$6.50—no par	83½	75½	84
COMMON STOCKS			
Operating Companies			
Adirondack Power & Light—50	a 30	22½	34
Appalachian Power—no par	a 72	66	93
Arkansas Light & Power	a 60	22	63
Brooklyn Edison	a123	107½	123
Buffalo General Electric	a168	118	170
Colorado Power	a 33	21	35
*Commonwealth Edison	a133	126	135
§Consolidated Gas, Electric Light & Power	a 35½	32½	37½
Dayton Power & Light	a150	70	180
Detroit Edison	a110½	102½	110½
|| Edison Electric Illuminating of Boston	a192½	163½	192½
*Kentucky Hydro-Electric	87½	84	87½
Long Island Lighting	200	100	200
Mississippi River Power	a 33	18	35
Montana Power	69½	61½	71
Niagara, Lockport & Ontario Power—no par	a 54	45	59
Northern Ohio Electric—no par	a 9	5	16
Northern States Power	a101½	92	106
North Texas Electric	a 65	58	84
Pacific Gas & Electric	a104	90½	104½
‡Penn Central Light & Power—no par	59½	57	60
§Pennsylvania Water & Power	a130	98½	135½
‡Philadelphia Electric—25	a 38½	29	39½
*Public Service Co. of Northern Illinois	a102½	96	103½
Puget Sound Power & Light	a 51½	43½	61½
Southern California Edison	a103½	95	106
Tampa Electric	a169	134	169
Tennessee Electric Power—no par	a 44½	20	45
Virginia Power	a 50	16	70
Virginia Railway & Power	a 65½	36	72½
West Penn. Co.	89½	47½	98

Companies	Bid Price Saturday, Nov. 29	Low 1924	High 1924
Holding Companies			
‡American Electric Power—50	62	22½	62½
American Gas & Electric—no par	a115	43½	115
American Light & Traction	a136	115	148
American Power & Light	a 54½	34½	54½
American Public Utilities	a 75	35	97
American Water Works & Electric	a140	40	140
Carolina Power & Light—no par	a245	82½	255
Cities Service	a169½	140	187
Columbia Gas & Electric—no par	a 44½	33	46½
Commonwealth Power Corp.—no par	a102½	56	109
Consolidated Gas—no par	a 78	60½	78
Continental Gas & Electric	a 82	49	96
Federal Light and Traction	a110	75	111½
General Gas & Electric	a 61	22	63
Lehigh Power Securities—no par	a 87	31	89
*Middle West Utilities—no par	a 77½	41	86
National Power & Light—no par	a185	60	190
North American—10	a 38	22	38
Philadelphia Co.—50	a 50½	42½	53½
Power Securities—no par	a 18	4	18
Public Service Corp. of N. J.—no par	a 68½	39	68½
Standard Gas & Electric—no par	a 39	31½	40½
United Gas & Electric (Conn.)—no par	a 34	14	42
Utah Securities	a 38	16½	38½
BONDS			
Operating Companies			
Adirondack Power & Light 6s	1950	a102	97½ 103
Alabama Power 5s	1946	a 96	90½ 97
Appalachian Power 5s	1941	a 96	89 96
Brooklyn Edison 5s	1949	a100½	97½ 102½
6s	1930	a104½	102½ 106½
7s	1940	107½	107 110½
Cleveland Electric Illuminating 5s	1939	a100	98½ 101
Commonwealth Edison 5s	1943	a100	95 101
5s	1953	a 98½	92 99½
§Consol. Gas, Elec. Lt. & Pwr. 4½s	1935	a 95½	91 96
6s	1949	106	102½ 106
Consumers' Power 5s	1936	a 99	94½ 99½
5s	1952	a 90½	87 92½
Detroit Edison 5s	1933	a101½	99 101½
Duquesne Light 6s	1949	a105½	103½ 106½
Great Western Power 5s	1946	95	90½ 96
Kansas City Power & Light 5s	1952	a 95½	89 96
Missicaippi River Power 5s	1951	a 97	92 97½
Montana Power 5s	1943	a 98½	95 99
New England Power 5s	1951	a100½	97 101½
New York Edison 6½s	1941	a113½	109½ 114½
Niagara Falls Power 6s	1950	a105½	104 106
Northern States Power 5s	1941	a 93½	89½ 94½
6s	1941	a105	101 105
Ohio Power 7s	1951	a106½	103 107
Pacific Gas & Electric 5s	1942	a 93½	90½ 95
Pennsylvania Water & Power 5s	1940	a 99½	96 100
‡Philadelphia Electric 5s	1966	a100½	97 103½
5½s	1947	a104½	99½ 105
6s	1941	a106½	103½ 107½
Portland Electric Power 6s	1947	a 94	89½ 97
Southern California Edison 5s	1939	a 99	96 100
6s	1944	a102½	100 103½
Tennessee Electric Power 6s	1947	a 98½	93½ 99
Texas Power & Light 5s	1937	97	91½ 97
Toledo Edison 7s	1941	a109½	106 110
Utah Power & Light 5s	1944	a 91½	87½ 93½
Holding Companies			
Alabama Traction, Light & Power 5s	1962	a 84½	65½ 86
American Gas & Electric 6s	2014	a 95	94 95½
American Power & Light 6s	2016	a 93½	91 94½
Amer. Water Works & Electric 5s	1934	a 92½	84½ 94
Associated Gas & Electric 6½s	1954	94½	92½ 94½
Central Indiana Power 6s	1947	a 95½	88 96½
Commonwealth Power 6s	1947	a 97½	87 98
Consolidated Cities Lt., Pwr. & Tr. 5s	1962	a 75	64 76½
Illinois Power & Light 6s	1953	a 99½	95 100½
United Light & Railways 5s	1932	94	87½ 94½
6s	1952	96	92 97½
ELECTRICAL MANUFACTURING COMPANIES			
PREFERRED STOCKS			
Allis-Chalmers Manufacturing	a103½	90	103½
*National Carbon	121	112	125
Worthington Pump & Machinery—A	87	68	87
COMMON STOCKS			
Allis-Chalmers Manufacturing	a 68½	41½	68½
American Bosch Magneto—no par	a 28½	22½	38½
Electric Storage Battery—no par	a 65½	50½	65½
General Electric	a272	173½	281
General Electric—10	a 11½	10½	11½
*Hurley Machine—no par	a 65	48	66
†Wagner Electric	26	20	34½
Westinghouse Electric & Manufacturing—50	a 65½	55½	65½
Worthington Pump & Machinery	a 47½	23½	50½
BONDS			
Canada General Electric 6s	1942	a107½	102½ 107½
General Electric 3½s	1942	83	80 84
5s	1952	a105	100 105½
Robbins & Myers 7s	1952	66	66 91½
†Wagner Electric Manufacturing 7s	....	101	97 101
Western Electric 5s	1944	a 98½	96 99½
Westinghouse Electric & Mfg. 7s	1931	a107½	106½ 109½

· Chicago Stock Exchange. †St. Louis Stock Exchange. ‡ Philadelphia Stock Exchange. || Boston Stock Exchange. § Baltimore Stock Exchange.
a Bid price Tuesday, December 2.

able patents and franchises, including such things as the patents on the incandescent lamp, but in the balance sheet these all are carried at a dollar. Furnishings in the different offices and the appliances except those in the factories also are carried at a dollar. Inventories in the factory, warehouses or on consignment are revalued regularly at cost or market, whichever is lower.

Even the company's plant is far more valuable than the balance sheet shows. Since 1892 the General Electric has spent, or had up to the beginning of 1924, $213,125,640 on manufacturing plants. Dismantled plant or that otherwise disposed of to the amount of $43,638,562 has been written off, leaving the cost of existing plant at $169,487,078. Against this valuation reserves of $111,617,876 have been set up, so that this valuable plant is carried on the books at $57,869,201. The plants represent over 25,000,000 sq.ft. of floor space, which could scarcely be constructed now at less than $12 a square foot, indicating a rough valuation of $300,000,000 or not far from five times the balance-sheet figure.

After liberal allowances for maintenance, depreciation and inventory write-offs and payment of all fixed and contingent charges and cash dividend of 8 per cent on common and 6 per cent on special stock, the General Electric Company during 1923 added to surplus $9,595,048 after paying a stock dividend of 5 per cent, or $8,984,375. This addition to what already had been set aside in previous years brought the total surplus up to $82,762,095. By turning surplus back into the property, as a reinvestment in the plant involving no increase in outstanding securities, the General Electric Company has raised its bonds and stock to a position almost unique among industrials.

General Electric bonds outstanding in the hands of the public total only $17,183,500. The company's special and common stock is outstanding at only $197,790,886. On the other side of the balance sheet current assets alone stand at $235,315,832, not to mention an investment of $77,684,401 in securities and the plant already discussed. Of course, there are liabilities other than stocks, but the figures give reason enough for the rise in General Electric common this year from 193½ to 281.

$100,000,000 Raised in November

New Issues by Electric Light and Power Companies Show Marked Gain Over Previous Months

DURING the month of November the electric service companies of the country raised $106,640,000 by the flotation of twenty-two issues of notes, stocks and bonds, a total which falls short of that reached in June, the banner month of the year, by only $350,000. The purpose of most of the issues was to obtain funds for expansion and for additions and improvements, though refunding also figured in the month's flotations. The largest individual piece of financing was the twenty-five-million-dollar offering of the Brooklyn Edison Company in the form of general mortgage bonds offered at par and maturing in 1949. The average yield, which has been on the decline since September, took a decided drop during the past month to 5.89, the lowest point of the year.

Company Reports

Among the company reports issued during the past week for the month of October are the following:

Name of Company	Gross Revenues for October 1924	1923
Alabama Power	$816,912	$833,396
Associated Gas & Electric	577,482	292,405
Bangor Railway & Electric	128,801	129,659
Baton Rouge Electric	59,219	51,504
Binghamton Lt., Heat & Pwr.	121,734	109,936
Blackstone Valley Gas & Elec.	419,190	417,696
Cape Breton Electric, Ltd.	53,341	59,380
Central Mississippi Valley Elec. prop.	50,993	49,559
Columbia Gas & Electric	1,938,060	1,624,002
Columbus Electric & Power	209,784	197,940
Commonwealth Power	2,598,953	2,639,467
Consumers Power	1,508,186	1,484,051
Cumberland Co. Pwr. & Lt.	327,422	318,754
Edison Elec. Illum. Co. of Brockton	143,093	138,784
Elec. Lt. & Pwr. Co. of Abington and Rockland	39,039	41,008
El Paso Electric	203,896	198,002
Fort Worth Power & Light	260,854	268,227
General Gas & Electric	,666,887	1,328,121
Houghton County Elec. Light	40,248	43,760
Idaho Power	211,906	193,089
Kansas Gas & Electric	442,846	436,292
Keokuk Electric	35,755	34,837
Key West Electric	22,252	19,944
Lowell Electric Light	139,665	128,280
Metropolitan Edison	669,847	640,272
Mississippi River Power	270,116	258,043
Nebraska Power	336,680	323,261
New Jersey Power & Light	94,168	84,279
Newport News & Hampton Ry., Gas & Electric	166,023	166,218
Northern Ohio Electric	869,153	786,472
Northern Texas Electric	235,554	258,112
Pacific Power & Light	267,563	293,173
Paducah Electric	50,767	50,589
Pennsylvania Edison	239,738	261,486
Portland Electri Power	885,169	903,484
Puget Sound Power & Light	1,028,259	1,062,716
Reading Transit & Light	241,312	258,998
Rutland Ry., Lt. & Power	43,738	43,183
Savannah Electric & Power	157,882	165,931
Sayre Electric	17,444	18,247
Sierra Pacific Electric	90,800	87,094
Southwestern Power & Light	1,111,324	1,034,140
Tampa Electric	198,660	176,981
Tennessee Electric Power	800,053	794,849
Texas Power & Light	611,744	562,918
United Gas & Electric	1,249,518	1,179,131
Utah Power & Light	788,341	777,155
Vermont Hydro-Electric	63,006	71,891

SECURITY ISSUES OF ELECTRIC SERVICE COMPANIES IN NOVEMBER

Name of Company	Amount of Issue	Period, Years	Class	Purpose	Interest Rate	Price	Per Cent Yield
Southeastern Power & Light Co.	$7,500,000	5	Secured gold notes	Acquisition of additional utilities and for loans to subsidiaries	6	100	6
Standard Power & Light Corp.	10,000,000	..	Cumulative preferred stock	To provide funds for purchase of control of other utilities and acquisition of hydro power sites	7	100	7
Cities Service Power & Light Co.	20,000,000	20	Secured sinking-fund gold bonds, series A	To acquire control of light and power companies	6	94½	6.50
Winnipeg Electric Co.	6,000,000	30	Refunding mortgage bonds	Refunding and for general corporate purposes	6	94½	6.40
Broad River Power Co.	1,250,000	..	Cumulative preferred stock	Acquisition of properties	7	93½	7.48
Central Iowa Power & Light Co.	6,500,000	20	First mortgage gold bonds, series A	Acquisition of properties	6	100	6
	1,000,000	10	Convertible general mortgage gold bonds, series A		7	100	7
Cleveland Electric Illuminating Co.	11,500,000	30	General mortgage gold bonds, series A	Betterments and extensions	5	100	5
Penn Public Service Corp.	4,000,000	30	First and refunding mortgage gold bonds, series D	Refunding and to reimburse in part for expenditures on additions	5	94	5.40
Platte Valley Power & Light Co.	800,000	2	First lien gold bonds	Proceeds for consolidating properties, funding indebtedness, to reimburse for expenditures on additions and for other corporate purposes	6	100	6
Western Public Service Co.	500,000	1	Mortgage lien gold notes, series A		6½	100	6.50
Page Power Co.	300,000	20	First mortgage gold bonds	Refunding and improvements	6	97½	6.20
Milledgeville Lighting Co.	260,000	25	First mortgage gold bonds, series A	Additions	6	96	6.30
Brooklyn Edison Co., Inc.	25,000,000	25	General mortgage gold bonds, series A	Refunding and to reimburse for capital expenditures	5	100	5
Atlantic City Electric Co.	750,000	30	First and refunding mortgage gold bonds	Construction	5½	99½	5.55
Beaverton Power Co.	130,000	20	First mortgage sinking-fund series A gold bonds	To reimburse for construction expenditures	6	97½	6.20
Lockport & Newfane Power & Water Supply Co.	300,000	30	First mortgage gold bonds	Construction	6	98½	6.10
Northern New York Utilities, Inc.	1,750,000	25	First lien and refunding bonds, series D	To reimburse for expenditures on additions and for construction	5½	97½	5.70
				Acquisition of stock	6½	95	6.85
United Light & Power Co.	5,000,000	50	Gold debentures		6	103	5.80
United Securities, Ltd.	2,500,000	..	Cumulative preferred shares				
Wahnapitae Power Co., Ltd. (Ont.)	500,000	20	First mortgage sinking fund gold bonds	Construction	6½	100	6.50
Wisconsin Gas & Electric Co.	1,100,000	28	First mortgage gold bonds		5	97½	5.15
Total	$106,640,000						

Business Facts for Electrical Men

Selected Statistics Presented Graphically for the Use of All Interested in Analyzing the Trend of the Electrical Business

Telephone Development in the World

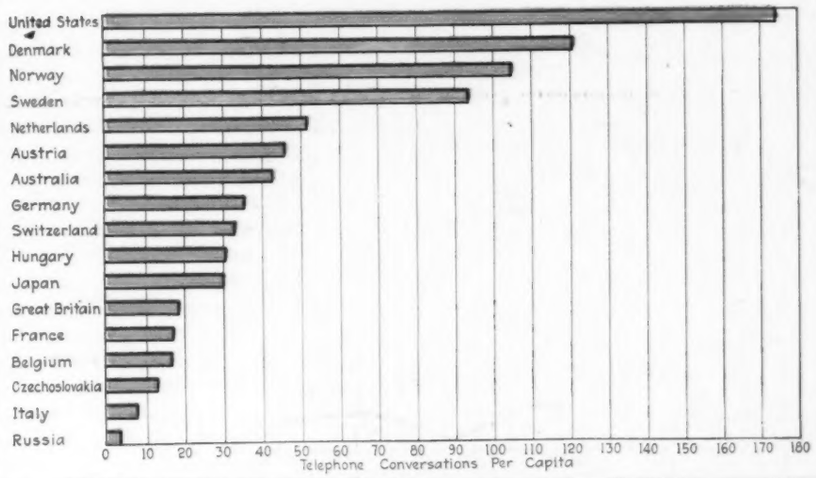
ELECTRICAL communication is today as essential a part of the domestic and commercial life of the world as are the electric light and the electric motor. Continents are joined together by telegraph cables, supplemented by wireless transmission, and on each continent distance as it affects communication has been wiped out by the telegraph and telephone and more recently by the radio. Messages of importance which a few years ago would have required several days to transmit are today delivered by word of mouth. Electrical communication has made the world almost like one community.

The accompanying diagrams on the telephone development of the world, which are based upon data collected by the American Telephone & Telegraph Company, show that 620,670 telephones were added during the year 1922 to the private-company systems operating in the United States.

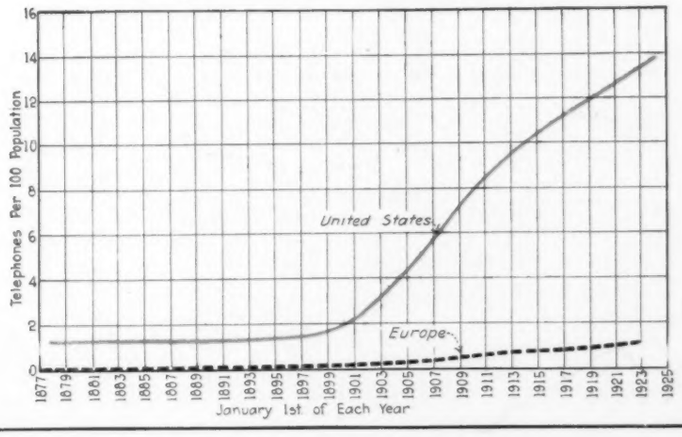
This is more than one-half of the total number of telephones added throughout the world during that year. Whereas on January 1, 1923, there were 13.1 telephones per 100 population in the United States, the highest developed European country from a telephone standpoint was Denmark, with 8.3 instruments per 100 inhabitants. Europe as a whole, notwithstanding the relatively high telephone service development in the Scandinavian countries, had at the date to which these figures refer only 1.2 telephones for every hundred people.

The telephone development of the United States also checks very closely with the development of the central station, for the central stations of the United States produce about twice as much energy as all the rest of the world combined. It is to the development of these servants of man that the United States owes her great prosperity and prestige.

Telephone Conversations per Capita

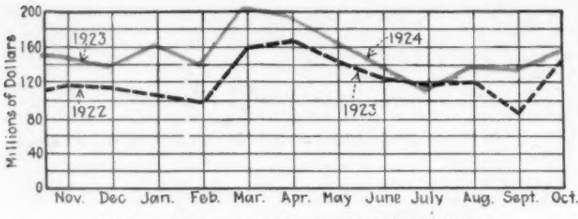


Telephones per 100 Population

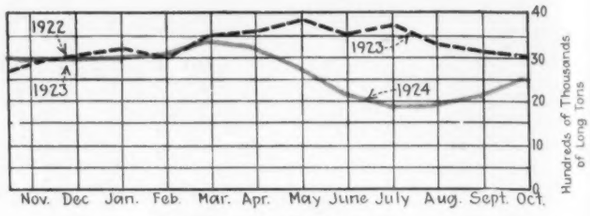


Most of the data for statistics in the ELECTRICAL WORLD are gathered by it from original sources. Privilege is freely given to readers of the ELECTRICAL WORLD to quote for use these statistics for any legitimate purpose. While there is no requirement that the source of data be given, yet it would help the ELECTRICAL WORLD in obtaining and compiling further basic information if those who make use of these statistics would give credit to the ELECTRICAL WORLD.

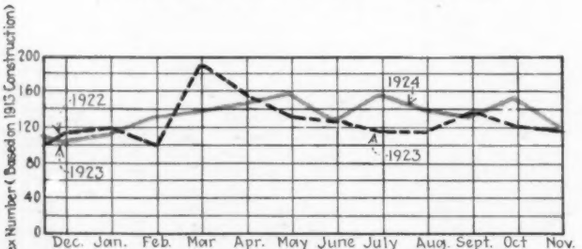
How the Primary Industries Are Trending



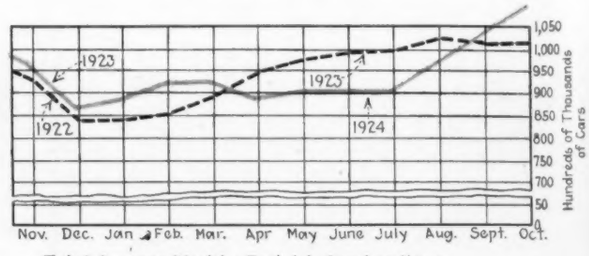
Contracts Awarded for Residential Buildings



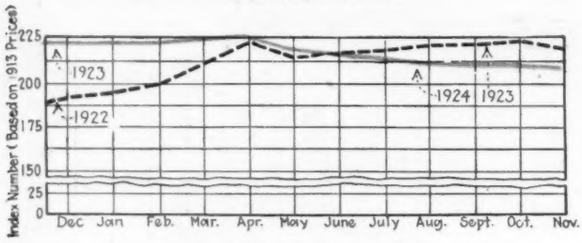
Pig-Iron Production



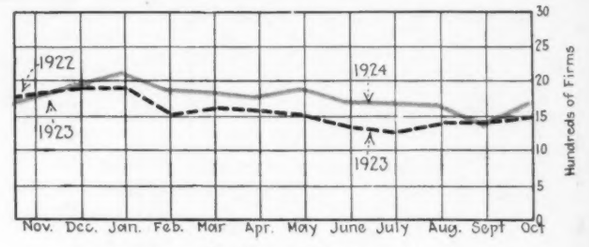
Construction Volume Index
(Engineering-News Record)



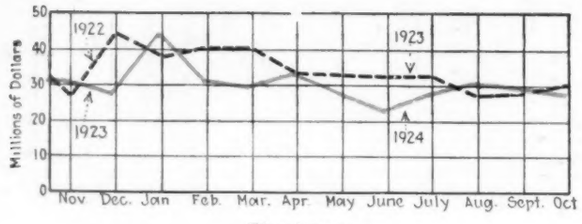
Total Average Weekly Freight-Car Loadings



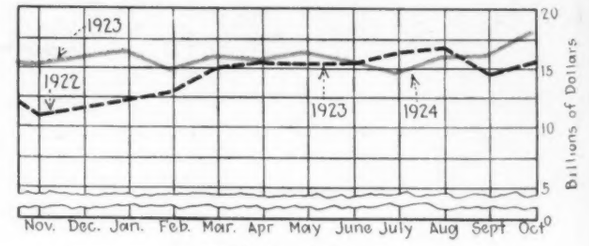
Construction Cost Index
(Engineering-News Record)



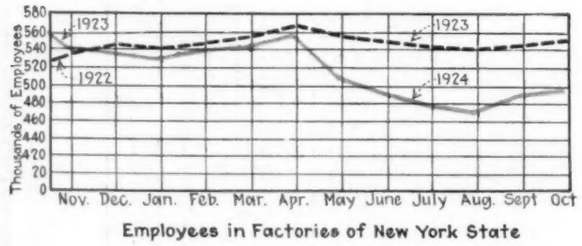
Business Failures



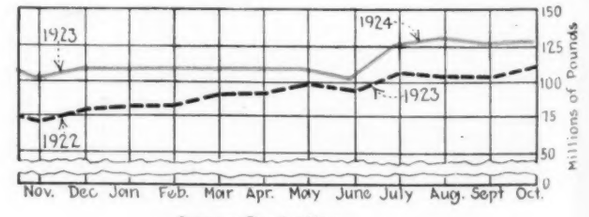
Fire Losses



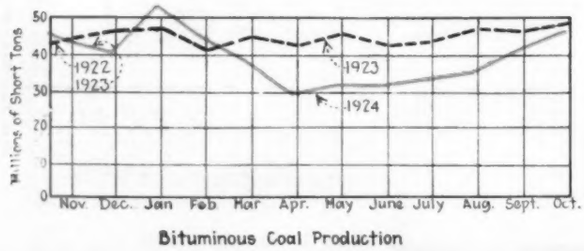
Bank Clearings
(Outside of New York City)



Employees in Factories of New York State



Copper Production



Bituminous Coal Production

Spirit of Optimism Pervades Business

OCTOBER witnessed no marked development in general business, but what change was made was in the direction of greater activity. The spirit of hopefulness prevalent during October has developed into genuine optimism since the election. Business appears to be headed for a good year in 1925.